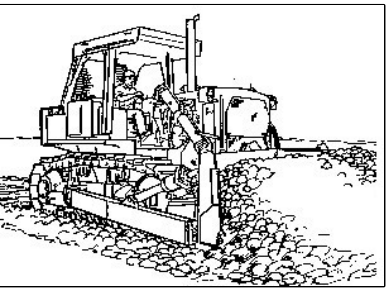
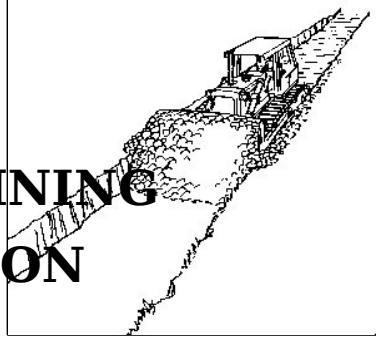


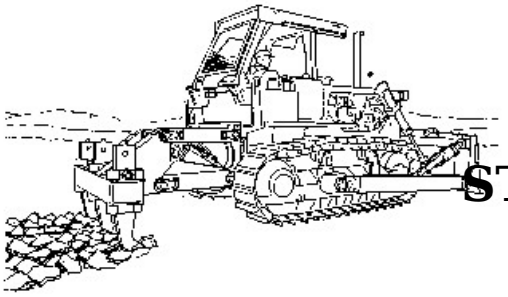


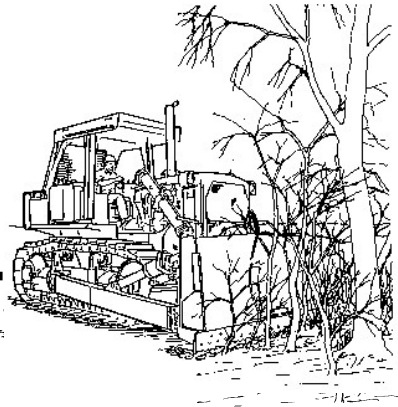
INTER-SERVICE TRAINING REVIEW ORGANIZATION

ARMY NAVY

CRAWLER TRACTOR PHASE

AIR FORCE MARINES





STUDENT HANDOUT

27 August 2001

TABLE OF CONTENTS

INTRODUCTION TO THE CRAWLER TRACTOR

PURPOSE: To prepare the student to be able to understand the technical training lesso
follow. It will include a briefing on the characteristics, capabilities, limitatio
components, instruments and controls, attachments, and operating techniq

SAFETY: Hard hats must be worn at all times. Hearing protection must be worn whil
running. Use 3 points of contact when mounting or dismounting crawler tra
caution around moving parts and hot radiators. Remove all jewelry and do n
loose clothing. Clear all personnel before starting engine.

REFERENCES: FM 5A34, earth moving operations, 15 June 2000
TM 5-2410-237-10, tractor, full tracked, low speed, dad, medium draw bar p
January 1993

LESSON OUTLINE:

1. Characteristics

a. Nomenclature: Tractor, Full Tracked, Low Speed, Diesel Engine Driven, Medium Drawbar Pull.

1. Dozers are classified by:

a. Weight

b. Drawbar pull

2. There are three types of classifications for dozers.

a. Light (D5/Case 1150) 0-39,000 lbs.

b. Medium (D7) 39,001-88,999 lbs.

c. Heavy (D8) 89,000 lbs. and up

2. Capabilities

a. The dozer is standard equipment for most earth moving operations.

b. Dozers with the ripper attachment are designed for dozing and ripping soil, rocks, asphalt and concrete.

c. Dozers with the winch attachment can winch loads of 50,000 lbs. at a line speed of 80 ft per minute.

d. Dozers with the winch attachment deliver 35,000 lbs. of drawbar pull at a speed of *1.4* mph.

f. Dozers are capable of fording water at depths up to 30 inches deep without fording kit and up to
60 inches when equipped with a fording kit.

g. The dozer is capable of negotiating a fore and aft slope of 45° and a side slope of 35° under
optimum conditions.

h. When equipped with a reinforced blade the dozer is capable of assisting scrapers in push loading
operations.

3. Limitations

a. Dozers have very slow moving (6.2 mph. Forward, 7.4 mph. Reverse).

b. Optimum operating range of the dozer is from 0-300 ft. Any earthmoving operations over 300 ft.
requires the use of other equipment.

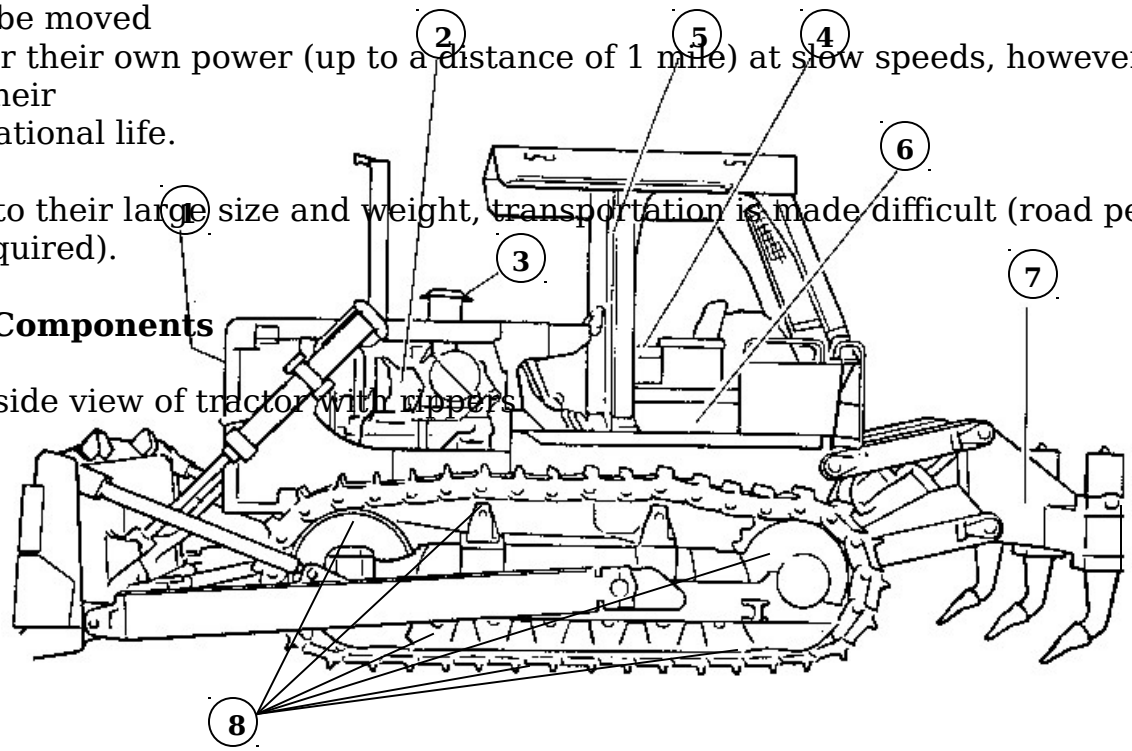
c. When crossing improved surfaces dunnage (tires, wood, AM-2 matting) is required to keep from
damaging surface.

d. Dozers must be transported long distances due to their slow speed and tracks. They may be moved
under their own power (up to a distance of 1 mile) at slow speeds, however this shortens their
operational life.

e. Due to their large size and weight, transportation is made difficult (road permits may be required).

4. Major Components

a. Left side view of tractor with rippers.



INTRODUCTION TO THE CRAWLER TRACTOR

1. Radiator. Contains coolant, which provides engine cooling.

2. Ether starting aid compartment. Location of the ether canister for cold weather starting.

3. Pre-cleaner. Prevents debris from entering the air intake system. Primary and Secondary filters.
Operator maintains the primary filter only.

4. Operators station. Location of all the controls and indicators which the operator uses during
operation.

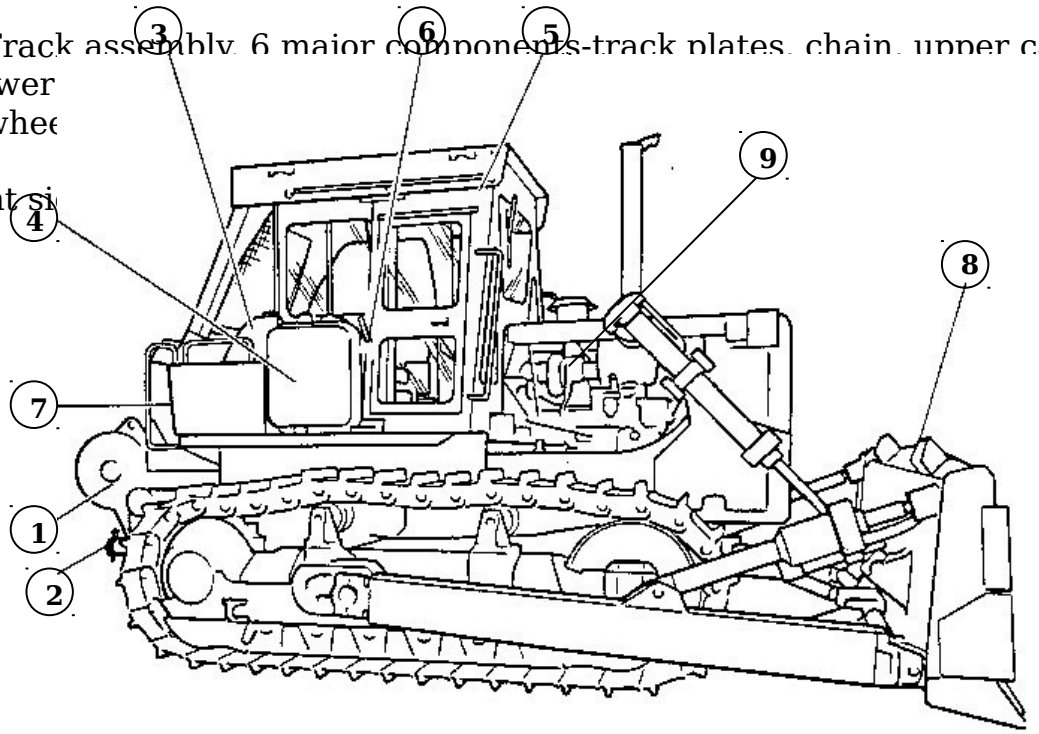
5. Rollover protection structure (ROPS). Protects the operator in the event of an accidental rollover.

6. Battery box. Holds the batteries, which provide current for the electrical system. 24 volt neg.
ground. Army (2) batteries and Marine (4) batteries.

7. Ripper. Used for loosening soil and for ripping through hard compacted soil.

8. Track assembly. 6 major components-track plates, chain, upper carrier rollers, lower
whee

b. Right si



1. Winch. Used for all types of winching operations

2. Drawbar. Used for towing other vehicles and equipment.

3. Fuel Tank. Contains diesel fuel for engine operation.

4. Hydraulic Oil Tank. Contains hydraulic fluid for hydraulic systems operation.

5. Winterized Cab. Protects the operator from severe weather.

6. Door Stop. The door can be secured to this arm to keep it in the open position.

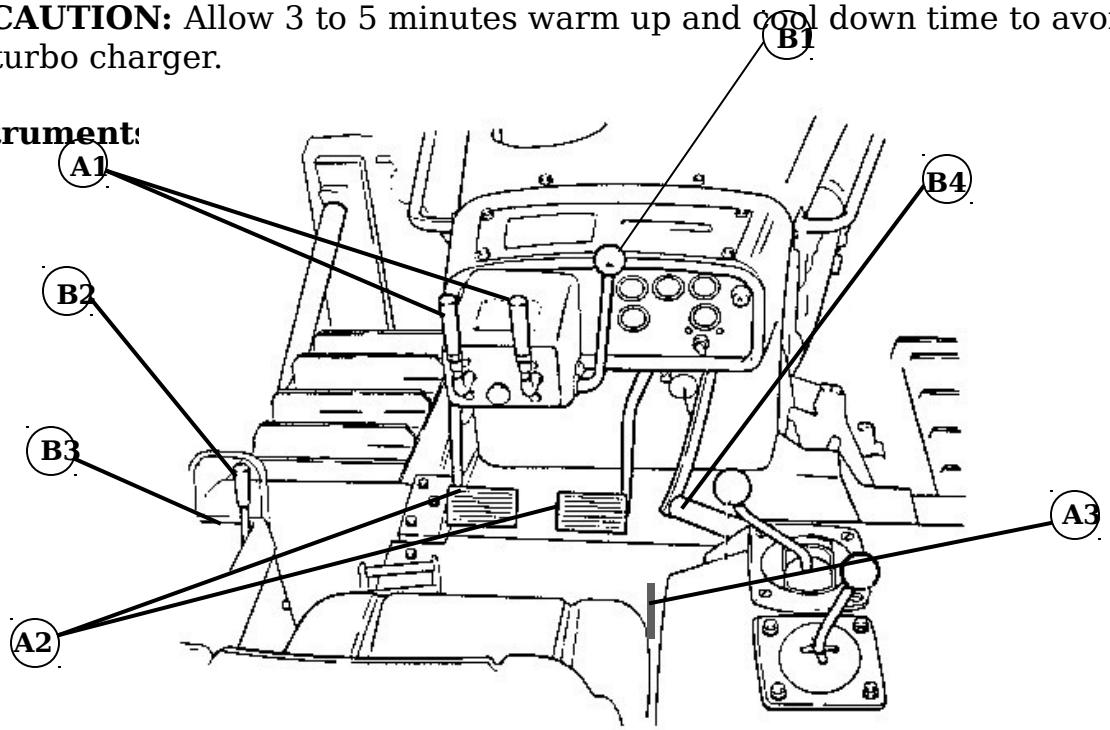
7. Tool Box. Contains the drawbar pin assembly for tractor with winch.

8. Straight Blade. Used for earth moving operations.

9. Engine. Caterpillar model 3306, 6 cylinder, in line, turbo charged, diesel driven. Produces
200 horsepower at 2000 rpm's.

CAUTION: Allow 3 to 5 minutes warm up and cool down time to avoid damage to the turbo charger.

5. Instrument



a. Steering and Brake Controls

1. Left/Right Steering Control Levers. Pulling the steering lever to the first detent causes the tractor
to make a gradual turn in the direction relative to the lever being pulled. When the lever is pulled
all the way back, the brake engages and causes the tractor to make a sharp turn.

2. Left/Right Brake Pedals. Depress the pedal to slow or stop the movement of

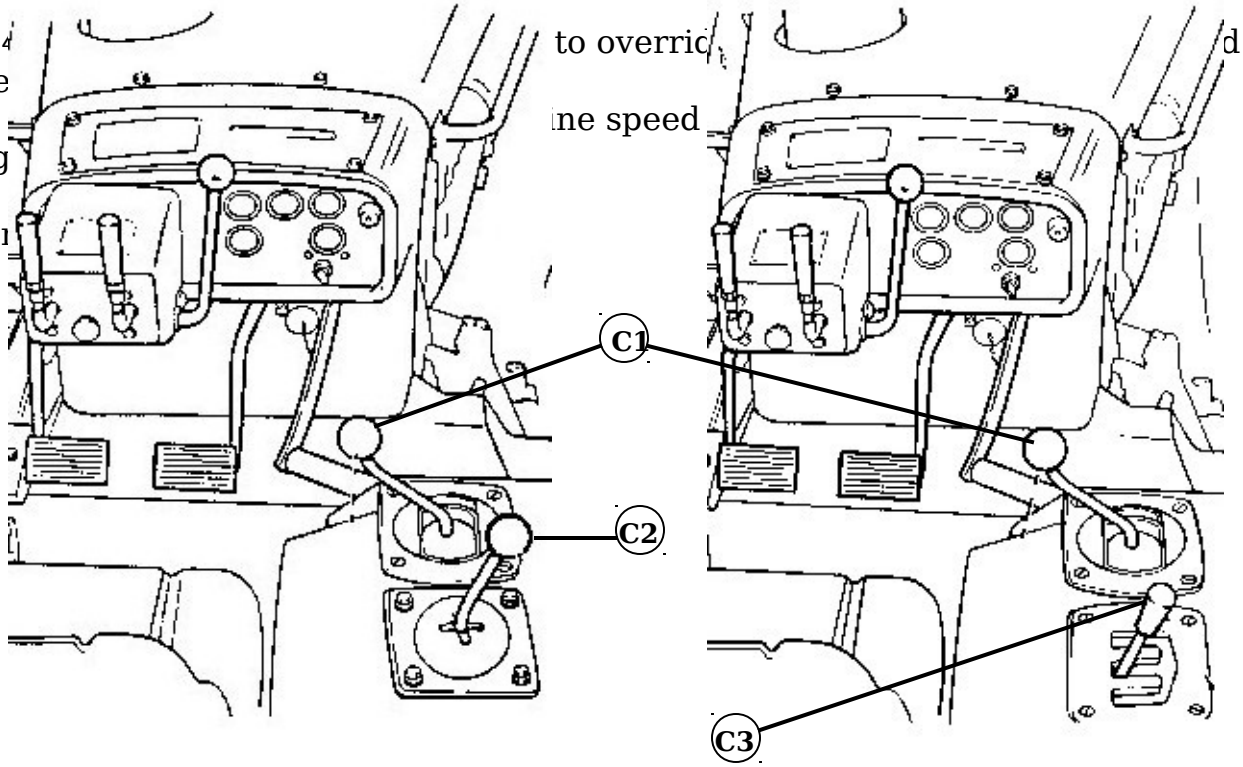
3. Brake Lock Lever. To engage, depress the left brake pedal firmly. Push brake lock lever down,
and then depress right pedal firmly. To release, depress both brake pedals and pull lock lever up.

b. Transmission and Engine Speed Controls

1. Governor Control Lever. This lever controls the speed of the engine. Pull the lever toward you to
increase the engine speed, and push the lever away to decrease engine speed. To shut off the
engine, push forward past detent.

2. Transmission Control Lever. This lever controls direction and speed of the tractor. The
transmission has three forward speeds and three reverse speeds. Maximum forward speed is
6.2 mph and maximum reverse speed is 7.4 mph.

3. Transmission Lock Lever. The transmission can be locked in NEUTRAL by pushing the lock
lever down. Pull the lever up to unlock the transmission selector lever.

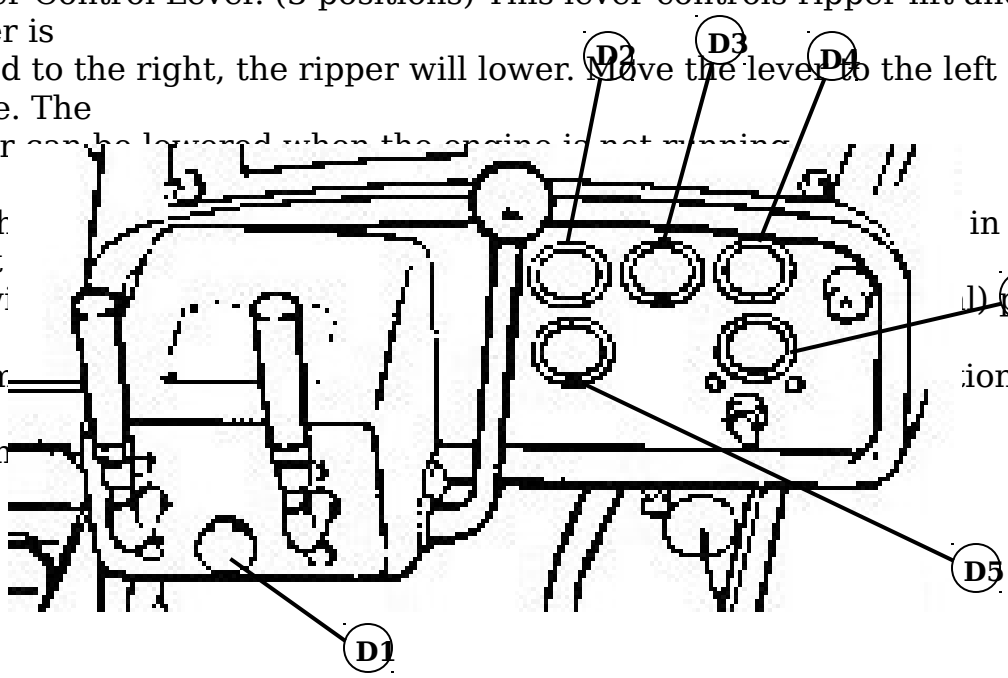


INTRODUCTION TO THE CRAWLER TRACTOR

1. Blade Control Lever. (6 positions) This lever controls blade lift and tilt. The lever is normally in the HOLD position. When the lever is moved to the right, the blade tilts so the right side is lower than the left side, and when it is moved to the left the blade will be lower on the left.

Move the lever backward to raise the blade, and forward to lower it. If the lever is pushed forward, past the lower position, it will go into the FLOAT position. The float position is the only position with a detent. In this position, the blade is free to move up or down according to outside forces.

2. Ripper Control Lever. (3 positions) This lever controls ripper lift and lower. When the lever is moved to the right, the ripper will lower. Move the lever to the left and the ripper will rise. The ripper can be lowered when the engine is not running.



3. Winch

in and the movement out

the wi

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autom

ion.

d. Gages on

1. Horn button. Push this button to sound the horn.

2. Service Meter. This meter operates whenever the engine is operating. It indicates the total operating hours of the tractor.

3. Ammeter. This meter measures the discharge current from the battery when the engine is off and key is on. When the engine is running, it measures the charging current from the alternator to the battery.

4. Oil Pressure Gage. This gage indicates oil pressure when the engine is running. The green

5. Water Temperature Gage. This gage indicates the temperature of the engine coolant. The green portion of the gage indicates normal operating temperature. The red portion indicates engine overheat.

6. Torque Converter Temperature Gage. This gage indicates the temperature of the torque converter oil. The green portion of the gage indicates normal operating temperature. The red band indicates overheating.

e. Fuel Pressure and Fluid Level Gages

1. Fuel Pressure Gage. This gage indicates fuel transfer pump delivery pressure. The green portion of the gage indicates normal pressure, and the red portion indicates that pressure is low.

2. Fuel Level Gage. This gage indicates the amount of fuel present in the fuel tank. 115 gal. Capacity marked in 10% increments.

NOTE: When fuel level is at 30% or less notify the instructor.

3. Oil Level Gage. This gage indicates the amount of engine lubricating oil that is present in the reservoir. Located on the left side of engine, 7.25 gal. Capacity of 15/40, cold and hot checks.

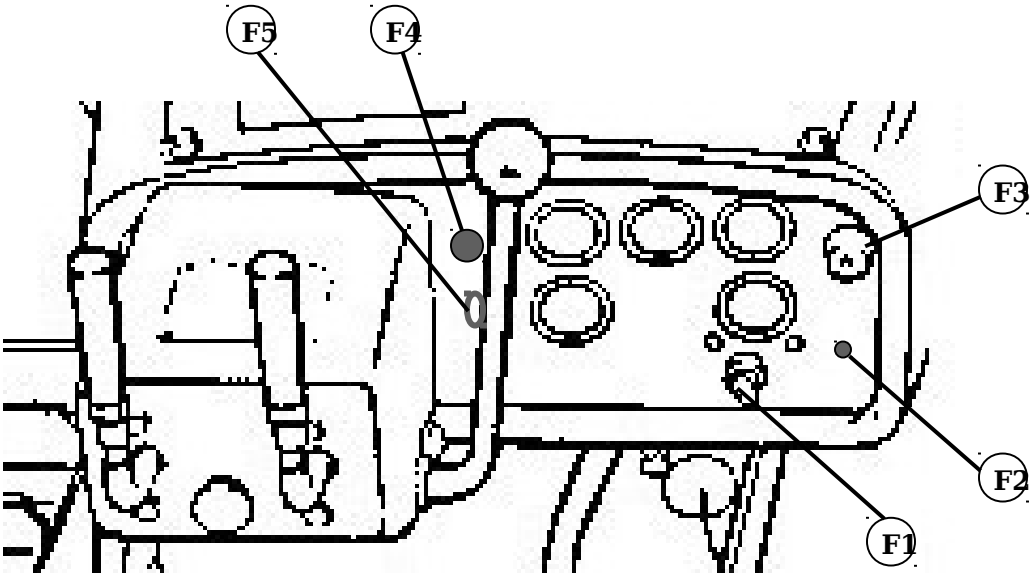
4. Air filter indicator. When the red band is visible it indicates that the air filter needs servicing. Reset by pushing the button on the bottom. Located on the left side of the engine.

5. Transmission Oil Level Gage. This gage indicates the amount of transmission oil that is present in the reservoir. Located under the operators seat, 18.5 gal. Capacity of 15/40. Check cold with engine off.

NOTE: This gage is located on left side near battery compartment on Marine dozers.

6. Hydraulic Oil Level Gage. This gage is a sight gage on the oil tank, which indicates oil level for the hydraulic implements. 21 gal. Capacity of 15/40.

f. Switches and Indicators



1. Start switch. This switch is key operated. Turn the key fully clockwise to start the engine.
Release the key when the engine starts, and the switch will move to the ON position.

2. Circuit breaker. A 60-amp circuit breaker protects the starting and charging circuits should a
malfunction occurs. Press to reset.

3. Exterior light switch. Turn the switch fully clockwise to turn on the exterior lights. Turn the
switch fully counterclockwise to turn off.

4. Starting aid button. Pressing the button causes ether to be injected into the air intake. It is used
to help start the tractor in cold weather.

5. Dash light switch. Flip up to turn dash light on, down for off.

6. Battery disconnect switch. This switch is key operated. In the OFF position, electrical power to
all systems is interrupted. In the ON position, power is available for all systems. Located on the
left side of the operators seat.

INTRODUCTION TO THE CRAWLER TRACTOR

1. A dozer blade consists of a moldboard, (3) cutting edges and (2) end bits. Blades vary in size and design based on their different earthmoving functions. At 3/4" from moldboard the cutting edges may be rotated, however the end bits must be replaced.

2. The following are different types of blades that can be attached to the dozer.

a. Straight blade

1. Used for cutting ditches and breaking through crusted material. It is mounted in a fixed position, perpendicular to the line of travel.

2. It can be tilted laterally 12 inches left or right of center with the use of the hydraulic controlled tilt cylinder, and the blade top can be pitched either forward or backward within a 10-degree arc using the manual adjustment assembly.

b. Angle blade

1. Effectively used to side cast material for backing filling or making side hill cuts. It is also used for rough grading, spreading piles, or windrowing materials.

2. This blade can be set at 90 degrees for normal dozing operations or at angles of 25 degrees left or right for side casting operations.

c. Special purpose blades

1. The D7G can also be equipped with several other & special purpose blades such as the mine clearing blade, "V" tree cutter (stringer blade), and various rakes.

b. Ripper

1. Dozers equipped with rippers normally have only three teeth mounted at the rear. Most ripping operations should be performed in first gear. Maximum penetrating depth of 29 inches.

CAUTION: Turning and backing with ripper down can cause damage to the shanks and shank assembly.

c. Winch

7. Operating Techniques

ENVIRONMENTAL: During operation, damage caused by erosion due to rain, must be limited by
dressing off the work area at the end of each day. Dust and exhaust created by
equipment also affects the environment, avoid any unnecessary equipment usage.

a. Winching

1. Dozers equipped with winches can be used for recovery of vehicles, towing, and holding a load.

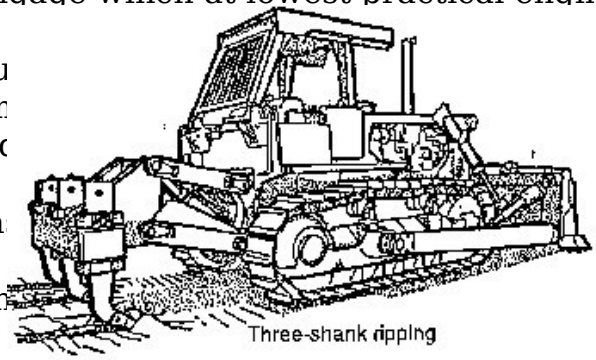
2. The winch can not be used to pull when there is less than three wraps of cable on the winch drum.
(232 ft. of 1 inch wire rope).

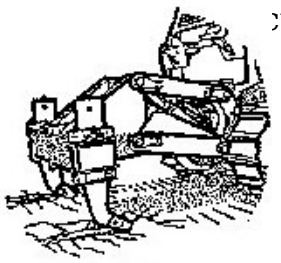
3. The winch line speed is controlled by the engine speed. For maximum service life of the winch,
engage winch at lowest practical engine speed (max 80 ft/min).

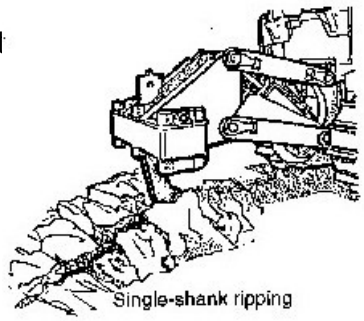
4. Mu ct
from dar
and

5. Ha

b. Rippin


Three-shank ripping


Two-shank ripping

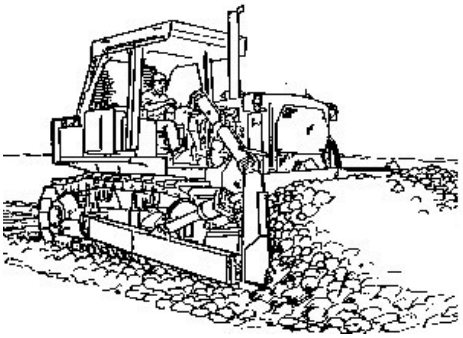

Single-shank ripping

1. For ripping soft material, all three shanks can be used. For medium material the outer two shanks
should be used. For hard material, one shank should be used and it must be the middle shank.

c. Leveling

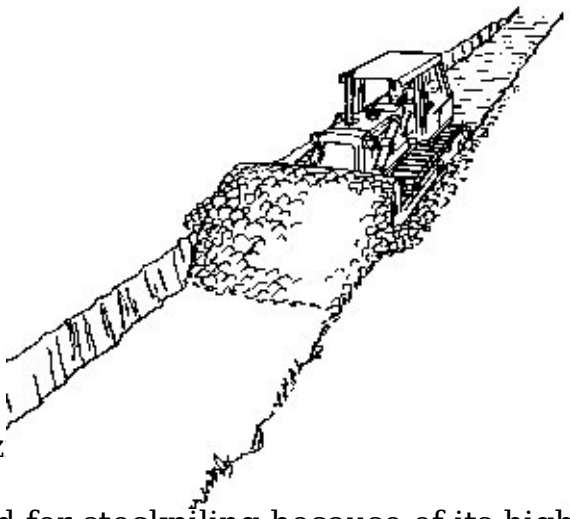
1. Also known as straight dozing, leveling is simply cutting high areas and filling the low areas to

d. Stockpiling



1. Stockpiling is a basic function of the crawler tractor in which large quantities of material are pushed into a pile and or leveled.

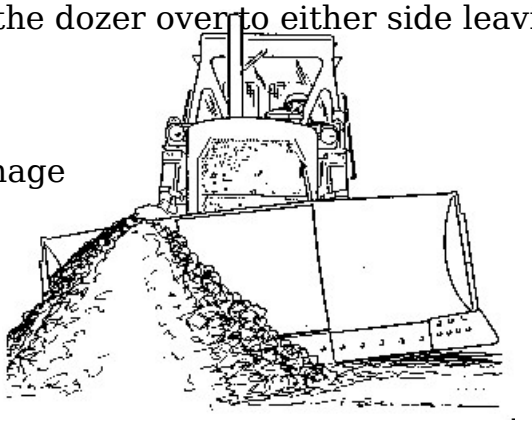
e. Ditching



1. Flat Bottom Ditching (Slot Doz

a. Slot dozing is recommended for stockpiling because of its high production output. Slot dozing uses the spillage from the first few passes to hold the material in the slot for all sequential passes.

b. To increase production output, move the dozer over to either side leaving a narrow uncut section between slots.



c. Used for large amounts of water drainage

d. Can be used to hide equipment

e. Increases work productivity by 50%

2. V- Ditching

a. The tilt cylinder on the dozer blade is designed to allow the dozer to cut shallow v-ditches by tilting the blade, allowing the corner of the blade to penetrate the ground.

b. The dozer can be used to cut larger ditches by cutting at right angles to the centerline of the ditch.

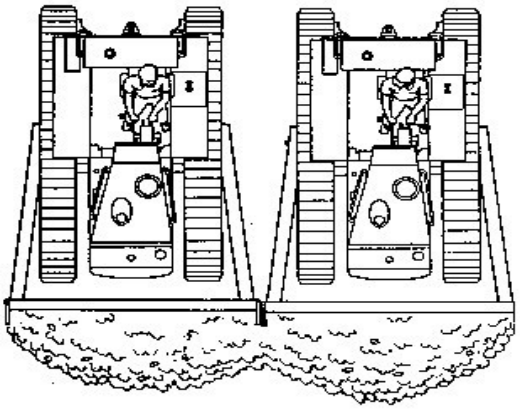
c. Once the desired depth has been reached, complete the ditch by smoothing

f. Push Loading

1. The dozer can also be used to assist scrapers in loading operations.

2. By centering the reinforced portion of the bull blade on the push block of the scraper, the dozer can be used to help the scraper load in all types of material.

g. Blade to Blade Dozing



1. Also known as "Buddy Dozing", blade to blade dozing is normally used for moving large amounts of material from 50 to 300 feet.

2. By putting both bull blades together, you can increase production output due to the larger area of excavation.

3. Remove the uncut section by normal dozing, and if the soil conditions are good, production output can be increased b

h. Downhill Dozing

1. When using the downhill dozing method, push the material all the way to the bottom of the hill.

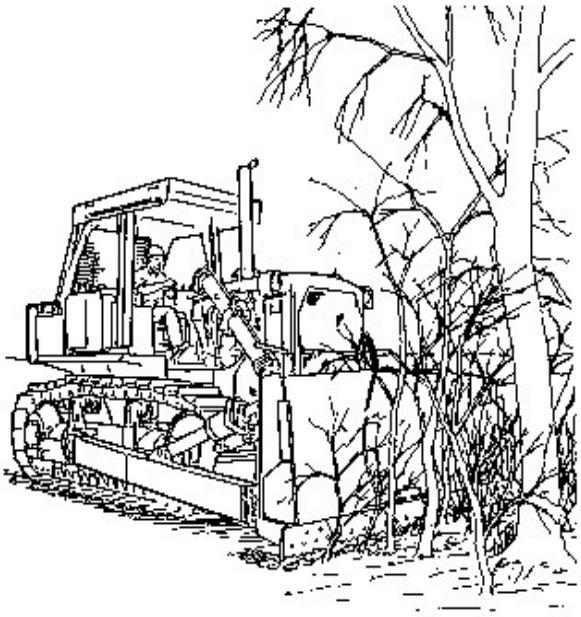
2. After several loads are piled at the brink of the hill, push them all to the bottom at the same time.

3. Use caution when steering on steep down grades, the tractor responds to steering controls differently.

4. To move gradually to the right, pull the left steering clutch to the first detent.

INTRODUCTION TO THE CRAWLER TRACTOR

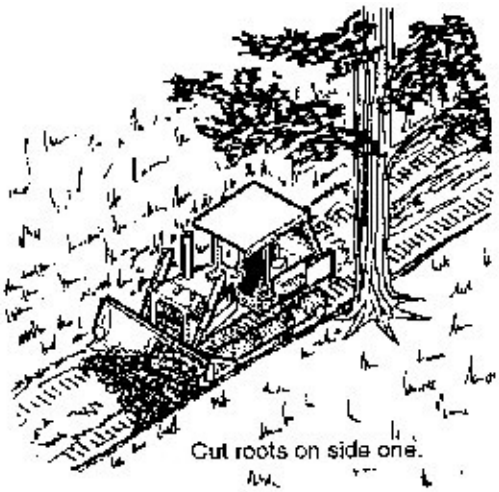
i. Brush and Tree Removal



1. Brush and Small Trees – Travel forward with your blade lowered into the ground only as far as it
takes to cut the brush and tree roots. It may be necessary to back up occasionally to clear the blade
of roots.

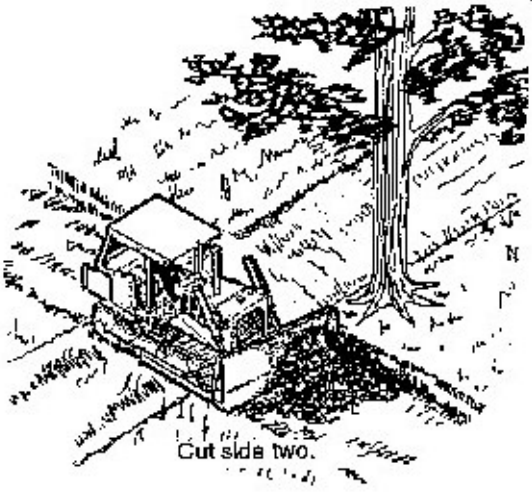
2. Medium Trees – Raise the blade as high as it will go, ease into the tree in low track speed and push.
As the tree falls over, back up and lower the blade under the exposed roots. Raise the blade to lift
out the trunk and roots of the tree as the dozer travels forward.

INTRODUCTION TO THE CRAWLER TRACTOR

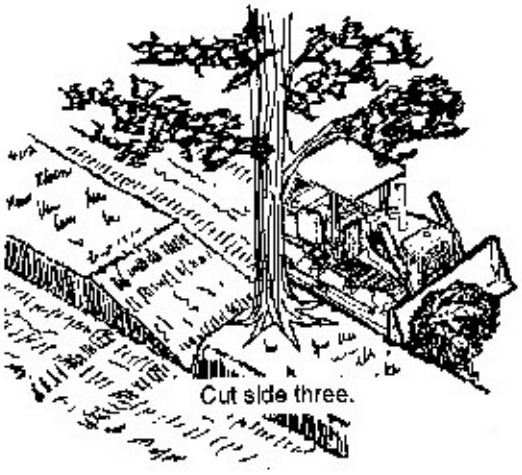


3. Large Trees – First check and see if it is a push over. If the tree doesn't push over, you need to cut its roots.

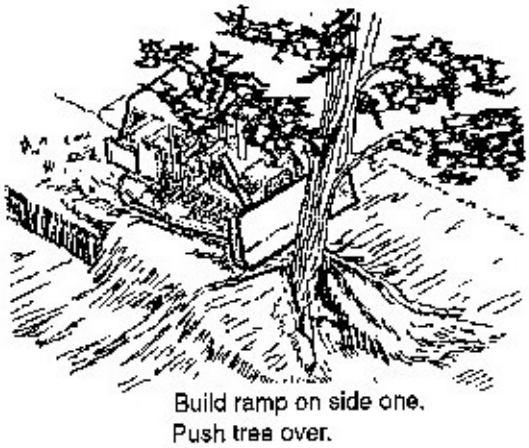
a. Determine the direction in which the tree will fall, then make a cut in the roots



ough to cut



b. Make similar cuts on both adjacent sides.

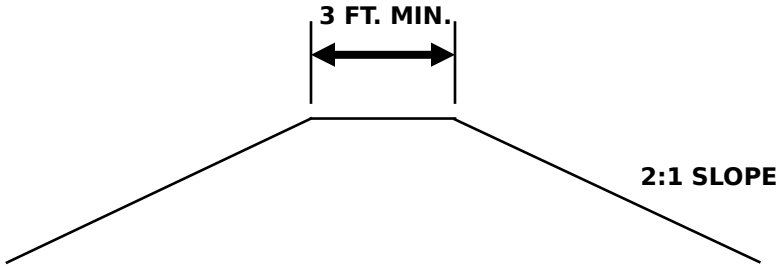


c. Once you have completed cutting the roots on three sides, fill in the first cut and make a ramp.

Proceed up the ramp with you blade lifted high and push. As the tree starts to fall, reverse the tractor quickly to get away from the raising root mass. Move forward into the fallen tree.

j. Berms and Dikes

1. Berms or dikes can provide protection against fragments and eliminate the risk of explosions caused from low-angle, high-speed fragments. Earth filled barricades can be used as an effective and expedient means of supplying the necessary protection.



a. Earth, 20 feet or less in height, should have a crest (berm) at least 3 feet wide.

b. Earth more than 20 feet in height, should be at least 5 feet wide at the top.

c. The slope shouldn't be steeper than 2 horizontal to 1 vertical to reduce erosion and ease maintenance.

PREVENTIVE MAINTENANCE CHECKS and SERVICES

PURPOSE: To provide the student with the skills and knowledge necessary to maintain and operate a crawler tractor.

SAFETY: Know and adhere to all hand signals. Maintain three points of contact when mounting or dismounting equipment. Perform 360 walk around before mounting or dismounting equipment. Wear double hearing protection, hard hats, and seat belts when operating equipment. Do not wear lose clothing or jewelry. Always look to the rear when backing up. Raise blade (and ripper if equipped) before backing up. Use caution when working on hills, banks, or slopes to avoid tipping . Do not place transmission in neutr4 to allow th crawler tractor to coast.

REFERENCES: TM 5-2410-237-10, tractor, full tracked, low speed, ded, medium draw bar pull, D7G, January 1993.
TM 5-2410-237-20, tractor, fill tracked, low speed, ded, medium draw bar pull, D7G, January 1993.

PROCEDURES:

1. Any equipment operator or mechanic can be trained to detect a breakdown and get it fixed. The real skill is to recognize a potential problem and prevent it from happening. That's where preventive maintenance comes in.

2. The key to successful preventive maintenance is the equipment record folder. You will be mainly concerned with the two documents DA form 2404 and DD form 1970. When completed, they must be:

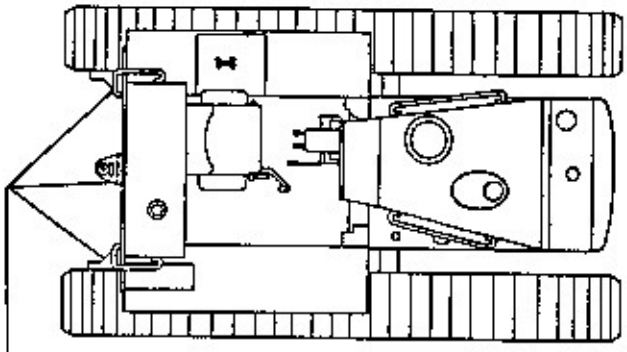
- Concise
- Easy to read
- Up to date
- Complete

a. These records should indicate what has been done, when it was done, and what needs to be done.

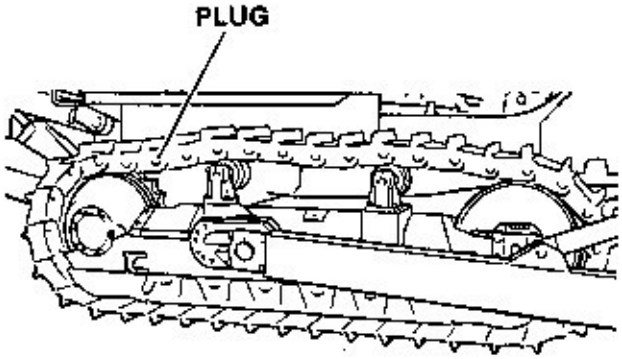
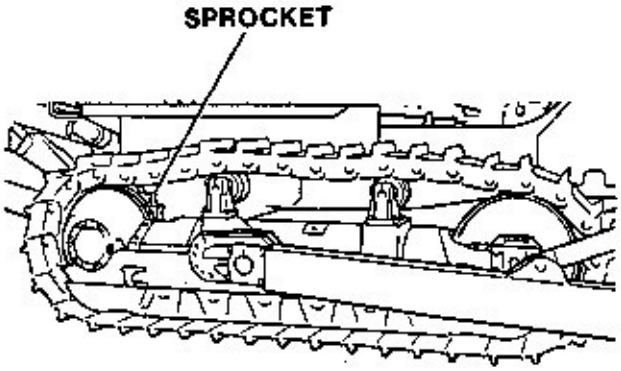
B-Before Operation D-During Operation A-After Operation W-Weekly M-Monthly

Item No.	Interval B	D	A	W	M	Item To Be Inspected Procedure: Do The PMCS and Have Items Repaired, Filled or Adjusted as Needed	Equipment is Not Ready/Available If:
						NOTE Perform all weekly and before operations PMCS if: (1) You are the assigned operator and have not operated since the last weekly. (2) You are operating for the first time.	
1						WALK-AROUND CHECKS	
						a. Radiator	
	●					(1) Check for leaks, worn hoses, and trash buildup.	Coolant is leaking.
	●					(2) Check coolant level. Coolant level should be within 1/2 inch (1cm) of bottom of fill pipe. Never check coolant on a hot engine.	No coolant is present, or low level.
						b. Engine.	
	●					Check oil level. Level must be within safe starting range on dipstick. See page 3-5. See LO 5-2410-237-12 for type of oil.	Oil is below safe starting range on dipstick.
						c. Hydraulic Oil Level.	
	●					(1) Check sight gage on hydraulic oil tank for dozer and ripper.	Oil is not visible in sight tube.
	●					(2) Check sight gage on winch. See page 3-14.	Oil is not visible in sight tube.
						d. Transmission and Final Drives.	
		●				(1) Check transmission fluid level. Level must be between ADD and FULL marks, when engine is at normal operating temperature.	Level is below ADD.
		●				(2) Check for fuel leakage.	Class I leaks are present.
		●				(3) Check for oil leakage.	Class III leaks are present.

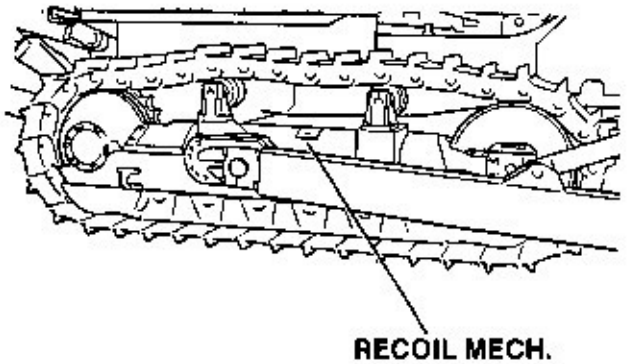
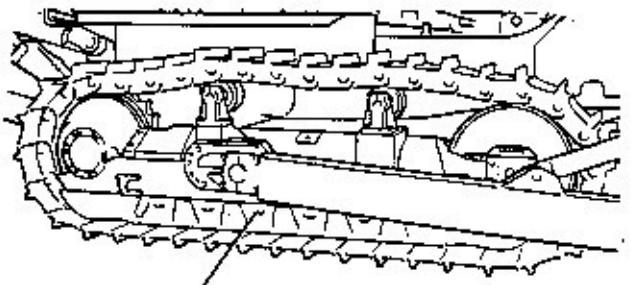
B-Before Operation D-During Operation A-After Operation W-Weekly M-Monthly

Item No.	Interval B	D	A	W	M	Item To Be Inspected Procedure: Do The PMCS and Have Items Repaired, Filled or Adjusted as Needed	Equipment is Not Ready/Available If:
	•					(4) Check on ground, in areas indicated, for signs of leakage.	Class III leaks are present.
						 TRANSMISSION AND FINAL DRIVES Check on ground for leaks	
						e. Ripper.	
	•					(1) Check ripper teeth and shanks.	Teeth or shanks missing or damaged and mission requires use of the ripper.
	•					(2) Check lift cylinder for leakage.	Class III leaks are present.
						f. Dozer.	
	•					(1) Check blade cutting edge and end bits.	Edge or bits are badly worn or damaged.
	•					(2) Check lift and tilt cylinders for leakage.	Class III leaks are present.
	•					(3) Check tilt cylinder lines which are exposed at radiator grill.	Lines show excessive wear or damage.
						g. Tracks.	
	•					(1) Inspect for damaged shoes and missing or loose bolts. Check master link for missing or loose bolts.	Any bolts are missing or loose.

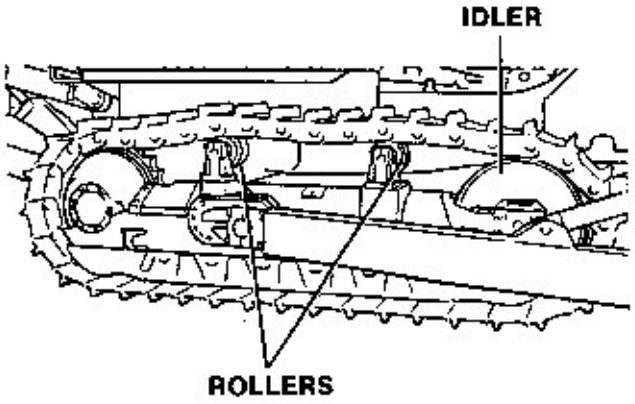
B-Before Operation D-During Operation A-After Operation W-Weekly M-Monthly

Item No.	Interval B	D	A	W	M	Item To Be Inspected Procedure: Do The PMCS and Have Items Repaired, Filled or Adjusted as Needed	Equipment is Not Ready/Available If:
	•					(2) Inspect links for missing or leaking oil plugs. 	Any leak is detected or plug is missing.
	•					h. Sprockets. Check for excessive wear and missing or broken segments. 	Any of the sprocket segments are damaged.
	•					i. Winch. Check for structural damages or leakage.	Class II leaks are present.

B-Before Operation D-During Operation A-After Operation W-Weekly M-Monthly

Item No.	Interval B	D	A	W	M	Item To Be Inspected Procedure: Do The PMCS and Have Items Repaired, Filled or Adjusted as Needed	Equipment is Not Ready/Available If:
2						RECOIL MECHANISM GUARD	
			•			Check for damage and loose or missing bolts.	Guard is damaged and/or bolts are missing or loose.
						 RECOIL MECH. GUARD	
3						TRACK ROLLER GUARD	
			•			Check for damage and loose or missing bolts.	Guard is damaged and/or bolts are missing or loose.
						 ROLLER GUARD	
4						CRANKCASE GUARD	
			•			Check for damage and loose or missing bolts.	Guard is broken or bent severely, or bolts are missing.
5						RADIATOR GUARD	
			•			Check for damage and loose or missing bolts.	Guard is bent or damaged or bolts are missing.

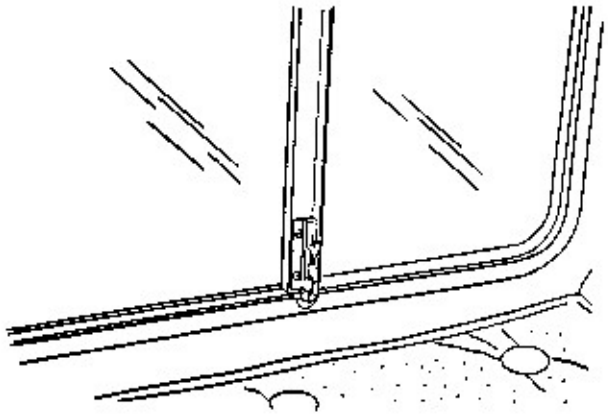
B-Before Operation D-During Operation A-After Operation W-Weekly M-Monthly

Item No.	Interval B	D	A	W	M	Item To Be Inspected Procedure: Do The PMCS and Have Items Repaired, Filled or Adjusted as Needed	Equipment is Not Ready/Available If:
6						IDLERS AND ROLLERS	
			●			Check for wear and leaks around the shaft.	Class III leaks are present.
							
7						BATTERIES	
						WARNING Batteries generate explosive and toxic gases. Keep sparks, flames, and other ignition sources away at all times. Battery gases can explode. Always shield eyes when working near batteries. Do not lean over the battery; and avoid breathing the gases.	
				●		Check electrolyte level. Fluid should be at triangle in fill plug opening. Add distilled water to bring level up.	
8						INDICATORS, GAGES AND CONTROL PANEL LIGHT	
	●					a. Check all gages and indicators for damage.	Damage prevents proper operation.
		●				b. Check oil pressure gage for proper operating pressure.	Needle is in the red zone.
		●				c. Check water temperature gage for proper operating temperature.	Needle is in the red zone.

B-Before Operation D-During Operation A-After Operation W-Weekly M-Monthly

Item No.	Interval B	D	A	W	M	Item To Be Inspected Procedure: Do The PMCS and Have Items Repaired, Filled or Adjusted as Needed	Equipment Is Not Ready/Available If:
		●				d. Check torque converter temperature gage for proper operating temperature.	Needle is in the red zone.
		●				e. Check fuel pressure gage for proper operating pressure.	Needle is in the red zone.
		●				f. Check service meter for proper operation.	
		●				g. Check air cleaner indicator for proper operation.	Red band is visible.
		●				h. Check ammeter for proper operation.	Needle is in the red zone.
		●				i. Check control panel light.	Light doesn't illuminate.
9						SERVICE BRAKES	
	●					Start engine and move ahead slowly. Depress both brake pedals and the tractor will stop.	Brakes do not function.
10						STEERING CONTROLS	
	●					Start engine and move ahead slowly. Test right and left steering while moving.	Either control fails to turn the tractor.
11						IMPLEMENT CONTROLS	
	●					Start engine. Test dozer and ripper controls for proper operation. Test dozer and winch controls on the TYPE II for proper operation.	Controls do not perform properly.
12						WINCH CABLE	
						WARNING	
						When handling the winch cable, wear a pair of heavy gloves. Damaged or frayed wires can seriously injure fingers and hands.	
					●	Check for fraying, kinking, and signs of rusting.	Cable is frayed or damaged.

B-Before Operation **D-During Operation** **A-After Operation** **W-Weekly** **M-Monthly**

Item No.	Interval B	D	A	W	M	Item To Be Inspected Procedure: Do The PMCS and Have Items Repaired, Filled or Adjusted as Needed	Equipment is Not Ready/Available
13						WINTERIZED CAB	
	●					a. Check for broken or damaged windows.	
					●	b. Check window latch on working window for proper operation.	
							
					●	c. Check door stop and securing bolt for proper operation.	
					●	d. Check door handles and locks for proper operation.	
		●				e. Check wipers for proper operation.	
		●				f. Check heater for proper operation.	
	●					g. Check defroster fans for proper operation.	
14						BACKING ALARM	
		●				Put transmission in reverse and listen for alarm to sound.	Alarm fails to sound.

LUBRICATION ORDER
16 December 1992

LO 5–2410–237–12

D7G Bulldozer With Winch
D7G Bulldozer With Ripper
Winterized D7G Bulldozer With Winch
Winterized D7G Bulldozer With Ripper

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS
You can help improve this manual. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, U.S. Army Tank-Automotive Command, ATTN: AMSTA-MB, Warren, MI 48397-5000. A reply will be furnished to you.

Reference TM5-2410-237-10, TM5-2410-237-20

Intervals (on condition or hard time) and the related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all the services prescribed for a particular interval. On-condition (OC) oil sample intervals shall be applied unless changed by the Army Oil Analysis Program (AOAP) laboratory. Change the hard time interval if your lubricants are contaminated or if you are operating the equipment under adverse operating conditions, including longer-than-usual operating hours. The hard time interval may be extended during periods of low activity. If extended, adequate preservation precautions must be taken. Hard time intervals will be applied in the event AOAP laboratory support is not available.

Clean fittings before lubricating. Clean parts with dry cleaning solvent (SD), type II or equivalent. Dry before lubricating. Dotted arrow points indicate lubrication on both sides of the equipment.

Level of maintenance. The lowest level of maintenance authorized to lubricate a point is indicated by one of the following symbols as appropriate: Operator/Crew (C); and Organizational Maintenance (O).

Reporting errors and recommending improvements. You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank forms) direct to: Commander, US Army Tank-Automotive Command, ATTN: AMSTA-MB, Warren, MI 48397-5000. A reply will be furnished to you.

TOTAL MAN-HR

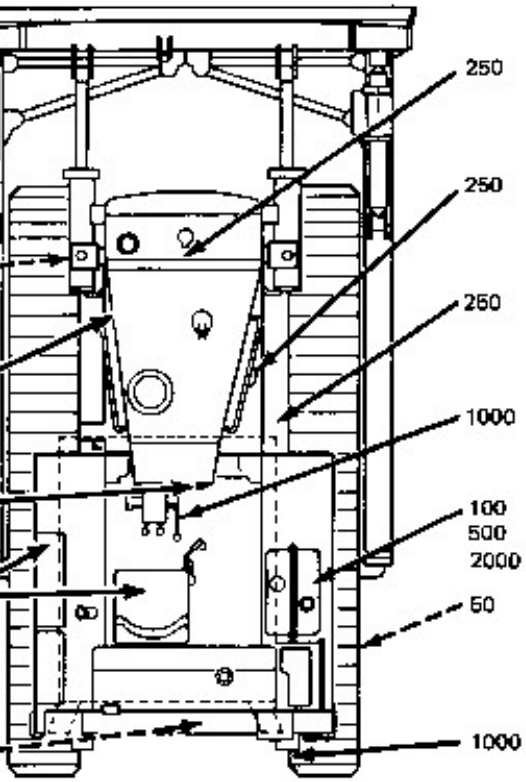
INTERVAL	MAN-HR
AR	0.1
10	0.1
50	1.0
100	1.0

TOTAL MAN-HR

INTERVAL	MAN-HR
250	1.0
500	2.0
1000	2.0
2000	2.0

CARD 1 OF 12

LUBRICANT	• INTERVAL		INTERVAL	• LUBRICANT
Bulldozer Tilt Brace Ball and Socket (O) (2 places) (See view A)	GAA	250	250 GAA	Fan and Adjusting Pulley Bearings (O) (2 places) (See view Q)
Bulldozer Tilt Brace (O) (1 place) (See view B)	GAA	250	250	Transmission System Filter Element (O) (See view P and Note 9)
Bulldozer Cylinder Support and Upper Trunnion Bearings (O) (6 places) (See view C)	GAA	50	250	Transmission System Magnetic Strainer (O) (See view O and Note 8)
Engine Crankcase (C,O) (See view D and Note 1)	OE/HDO	Q 250	1000 GAA	Universal Joints (O) (2 places) (See view N)
Torque Divider Suction Screen (O) (See view E and Note 2)		AR	100 OE/HDO 500 2000	Hydraulic System (O) (See view M and Note 7)
Transmission, Bevel Gear and Steering Clutch Compartments (O) (See view F and Note 3)	OE/HDO	250 1000	50 GAA	Track Roller Frame Outer Bearings (O) (2 places) (See view L)
Track Roller Frame Inner Bearings (O) (2 places) (See view G)	GAA	50	1000 OE/HDO	Final Drives (O) (See view K and Note 6)
			50 GAA	Ripper Linkage Cylinder Bearings (O) (20 places) (See view J)
Winch (O) (See view H and Note 4)	OE/HDO	1000	500	Winch Change Filter and Wash Magnetic Strainer (O) (See view I and Note 5)

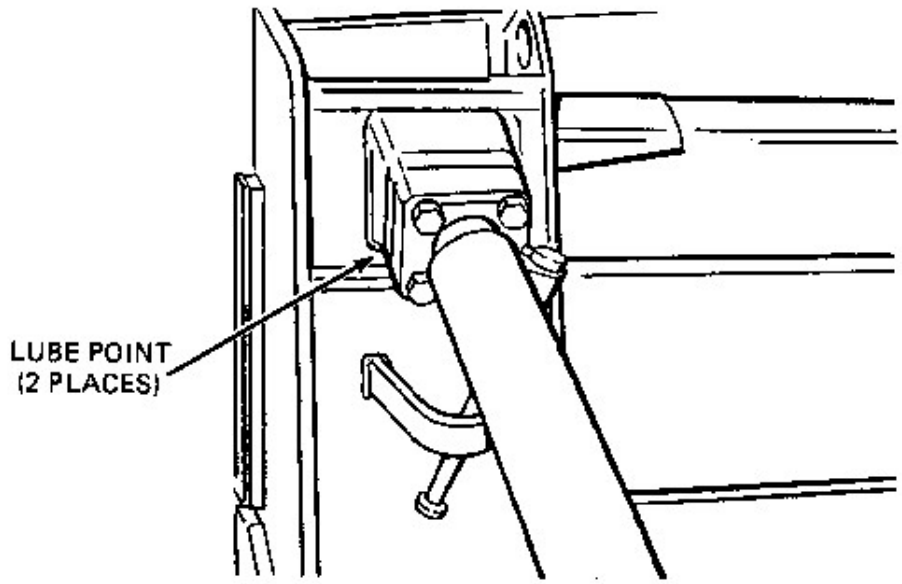


RIPPER (OPTIONAL)

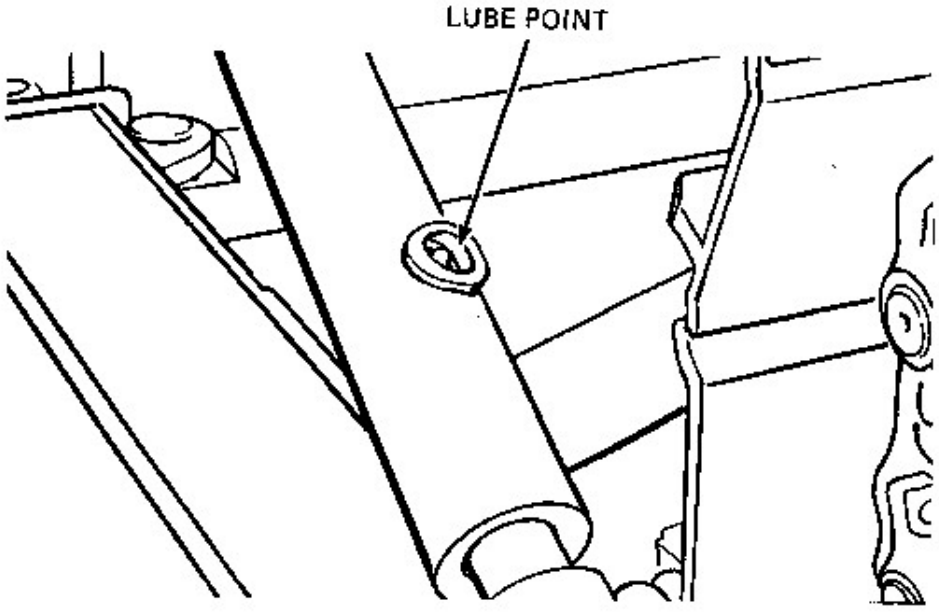
WINCH (OPTIONAL)

TOP VIEW

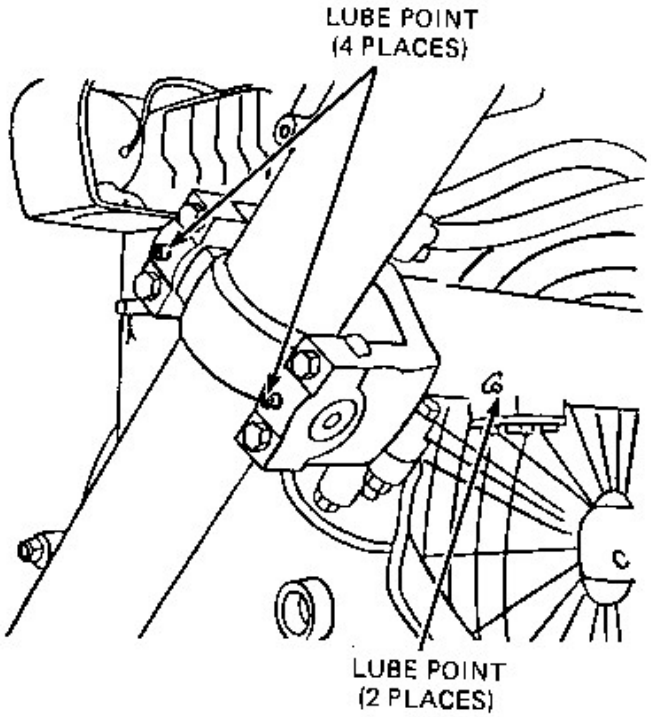
VIEW A BULLDOZER TILT BRACE BALL AND SOCKET



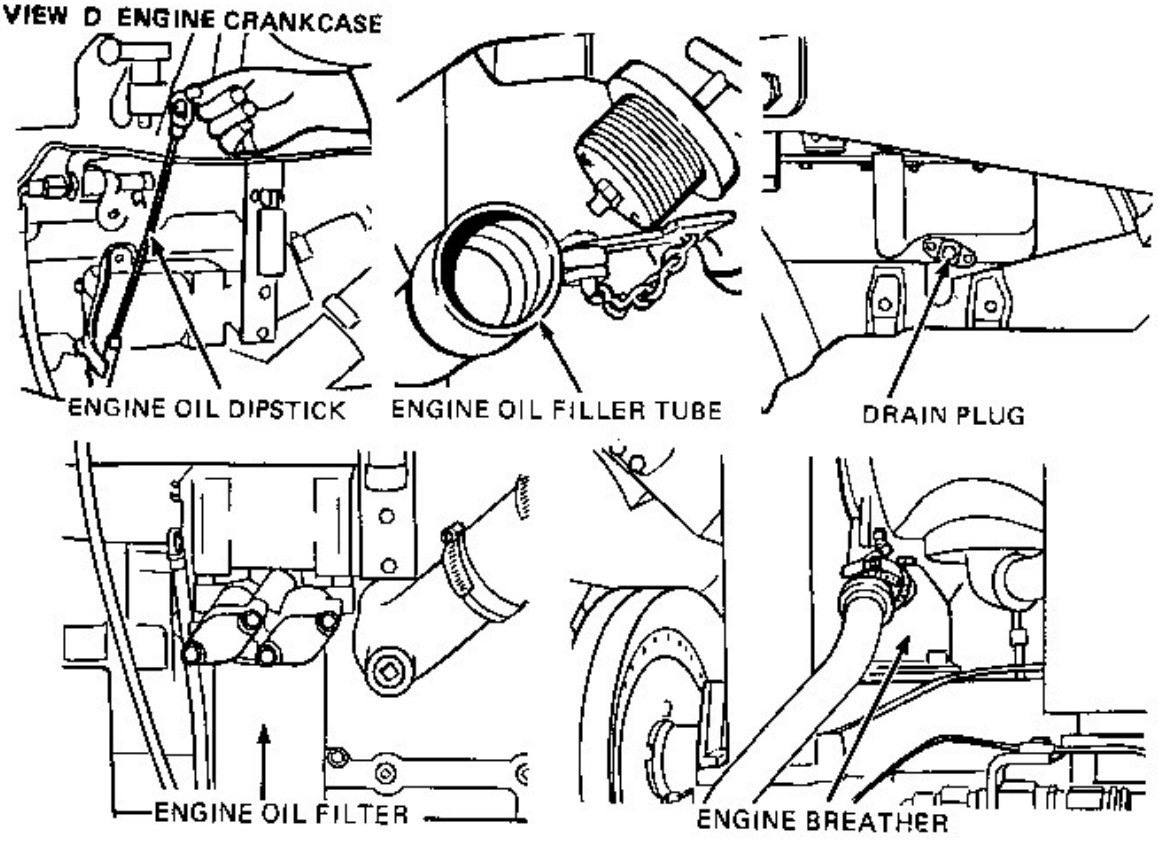
VIEW B BULLDOZER TILT BRACE



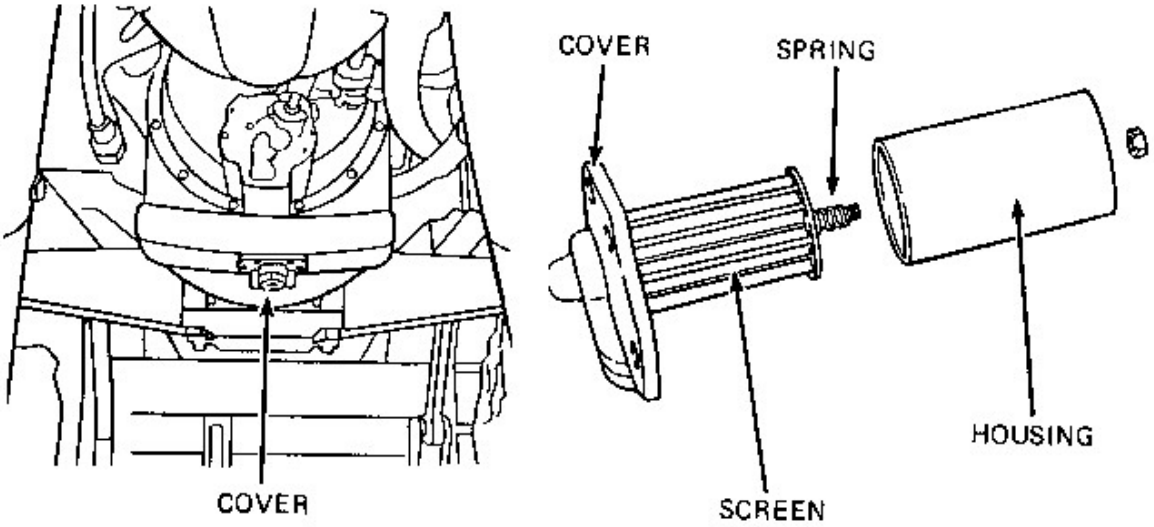
VIEW C BULLDOZER CYLINDER SUPPORT AND UPPER TRUNNION BEARINGS



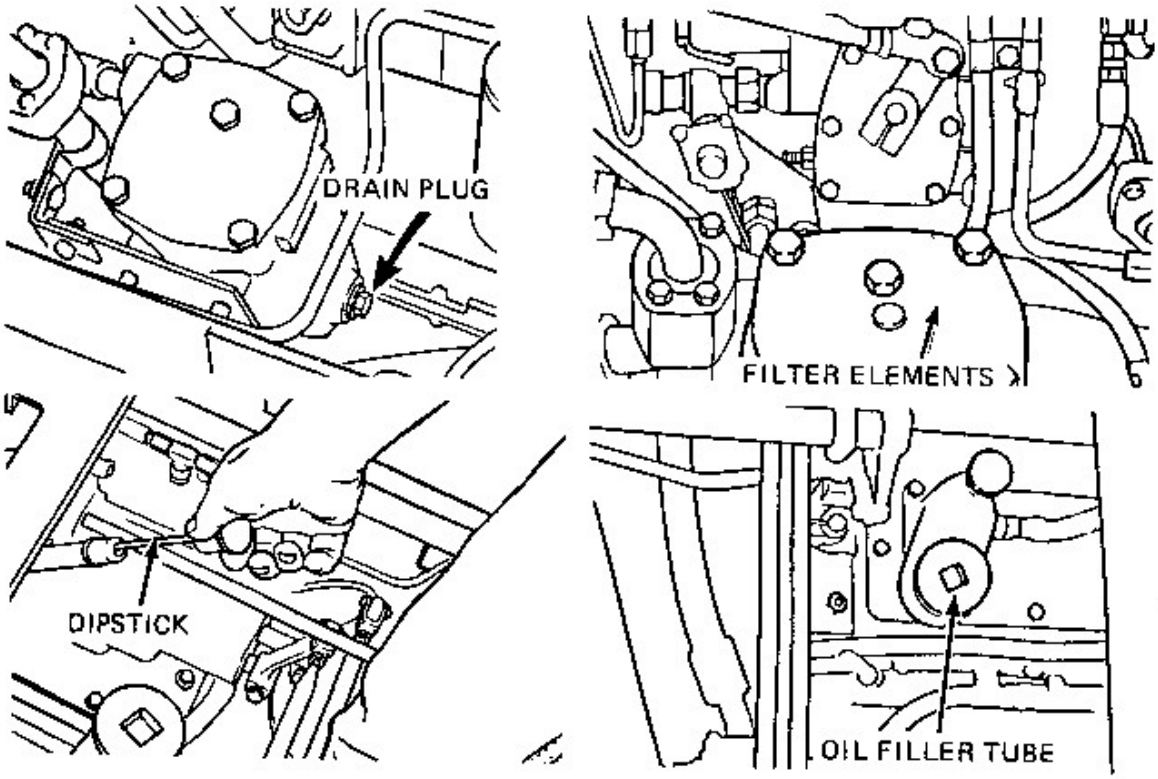
VIEW D ENGINE CRANKCASE



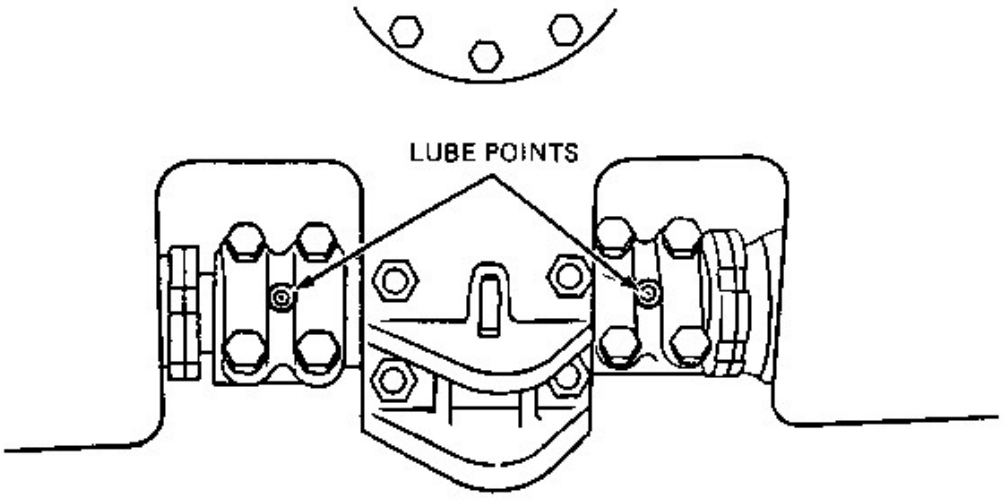
VIEW E TORQUE DIVIDER SUCTION SCREEN



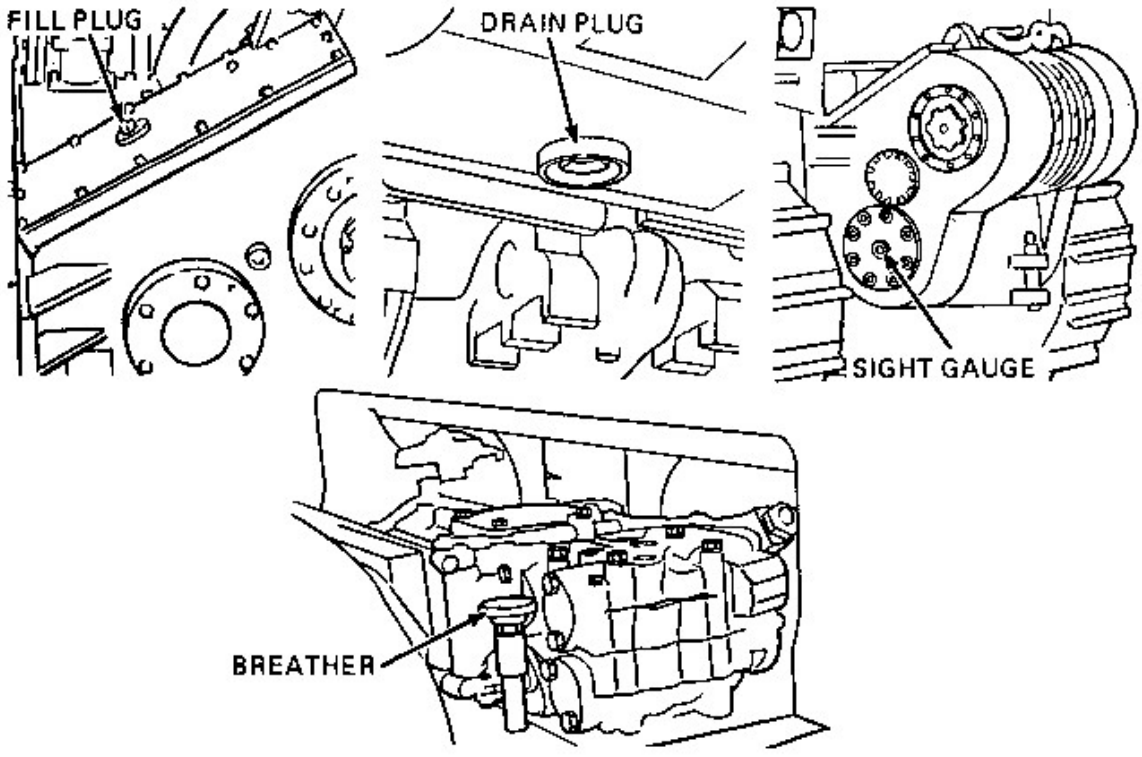
VIEW F TRANSMISSION, BEVEL GEAR AND STEERING CLUTCH COMPARTMENTS



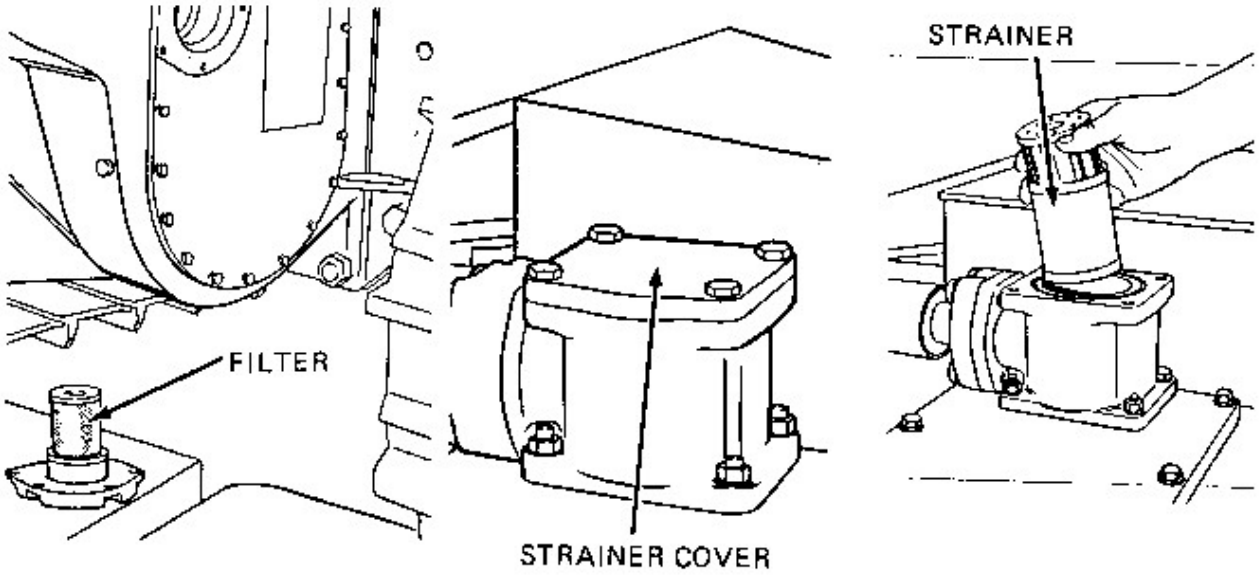
VIEW G TRACK ROLLER FRAME INNER BEARINGS



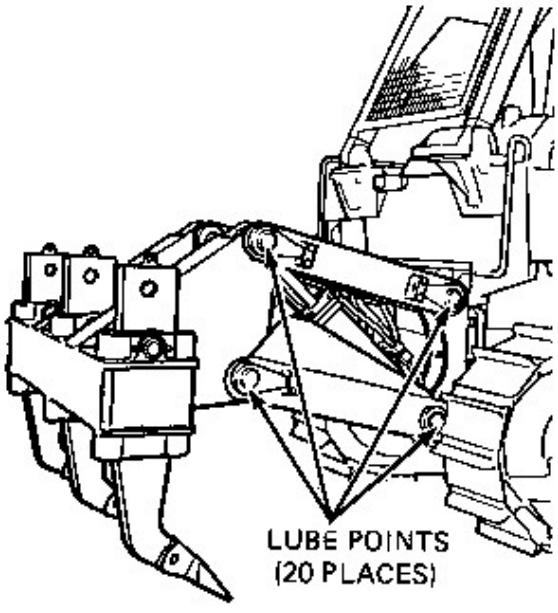
VIEW H WINCH



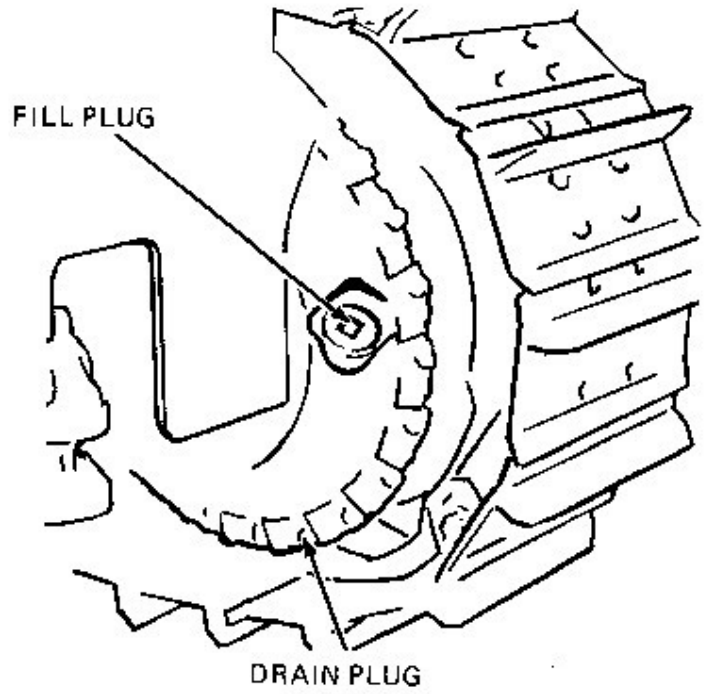
VIEW I WINCH FILTER AND MAGNETIC STRAINER



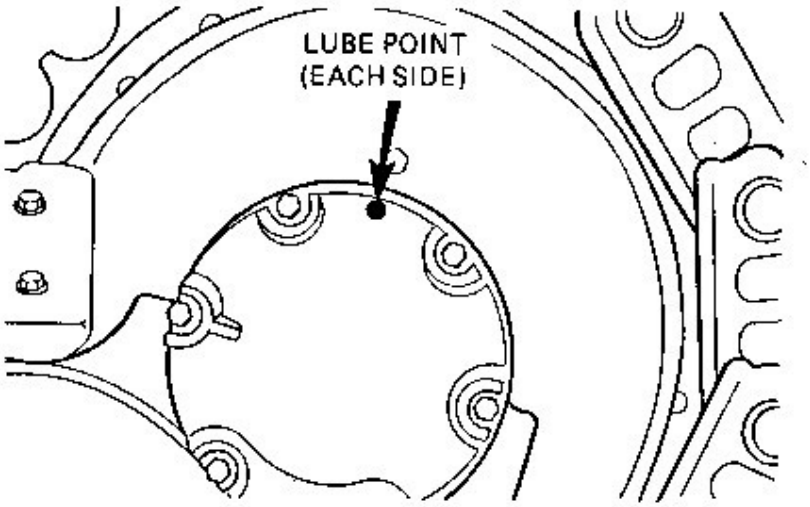
VIEW J RIPPER LINKAGE CYLINDER BEARINGS



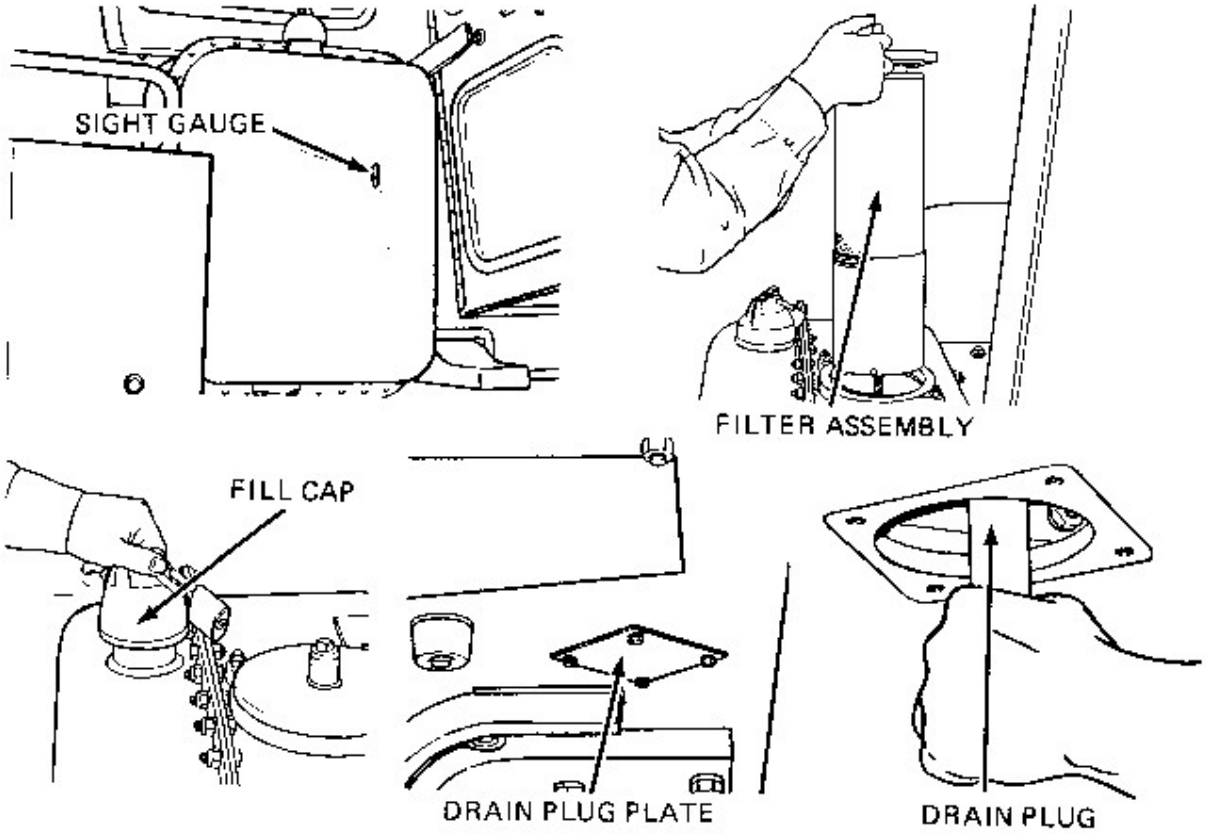
VIEW K FINAL DRIVES



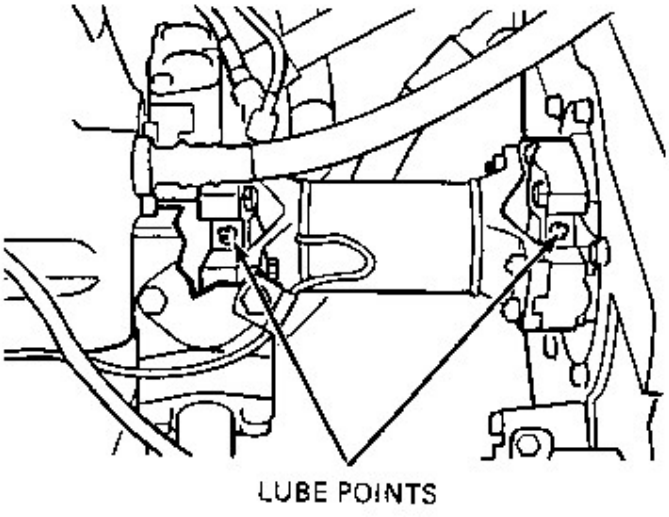
VIEW L TRACK ROLLER FRAME OUTER BEARINGS



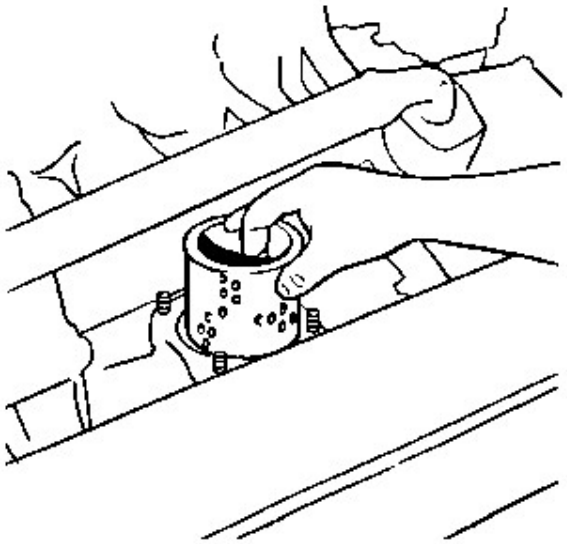
VIEW M HYDRAULIC SYSTEM



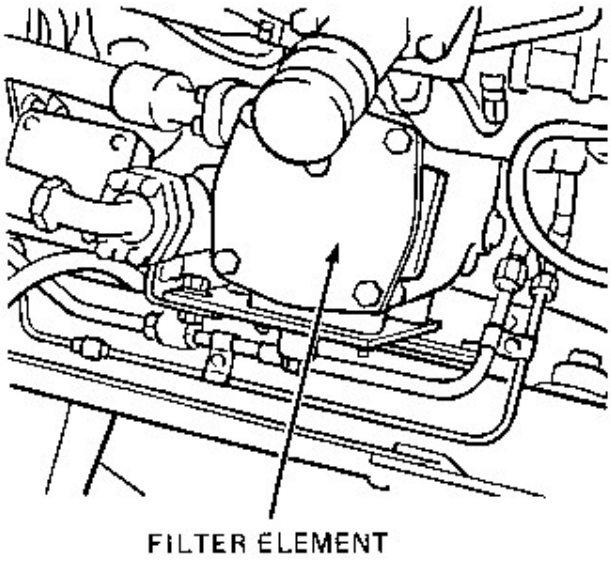
VIEW N UNIVERSAL JOINTS



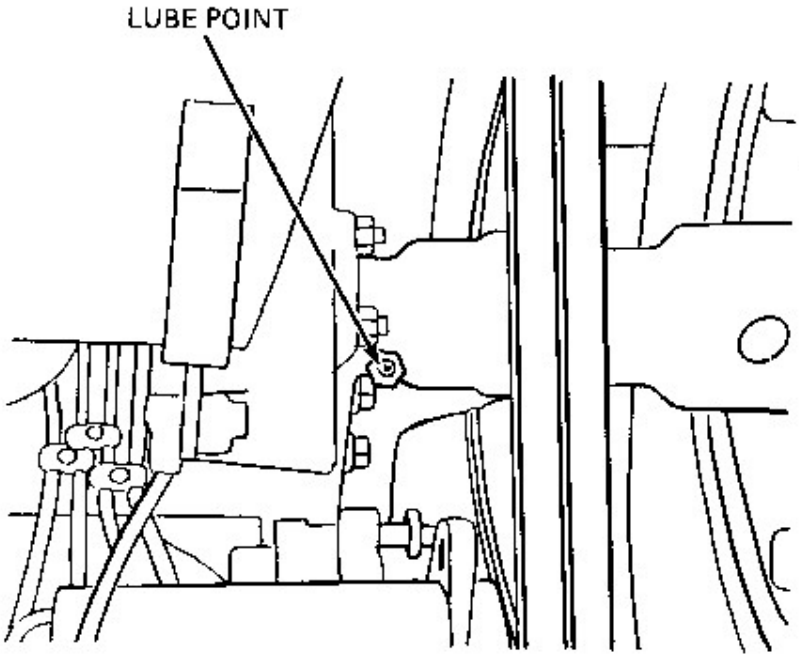
VIEW O TRANSMISSION SYSTEM
MAGNETIC STRAINER



VIEW P TRANSMISSION SYSTEM
FILTER ELEMENT



VIEW Q FAN PULLEY BEARINGS



KEY							
LUBRICANT		CAPACITIES	EXPECTED TEMPERATURE			For Arctic Operation Refer to FM 9-207	INTERVALS
			Above +15F (Above -9C)	+40F to -15F (+4C to -26C)	+40F to -65F (+4C to -54C)		
OE/HDO (MIL-L-2104) OEA (MIL-L-46167)	Lubricating Oil, ICE Tactical Lubricating Oil, ICE, Arctic Engine	7.25 gal. 27 l.	OE/HDO-15/40 OR OE/HDO-30 (0-238) SEE NOTE 1	OE/HDO-15/40 OR OE/HDO-10 (0-237) SEE NOTES 1 & 2	OEA (0-183)		10 - 10 hours 50 - 50 hours 100 - 100 hours 250 - 250 hours 500 - 500 hours 1000-1000 hours 2000-2000 hours AR - as required Q - Quarterly
	Transmission, Bevel Gear and Steering Clutch Compartment	18.5 gal. 70 l.					
	Towing Winch	16 gal. 61 l.					
	Track Roller & Idlers	As Req					
	Hydraulic System	21 gal. 79 l.	OE/HDO-15/40 OR OE/HDO-10 (0-237) SEE NOTES 1 & 2	OE/HDO-15/40 OR OE/HDO-10 (0-237) SEE NOTES 1 & 2	OEA (0-183)		
GO (MIL-L-2105)	Lubricating Oil, Gear, Multipurpose Final Drives	9 gal. 34 l. (each)	GO-80/90 (0-226) SEE NOTE 3	GO-80/90 (0-226) SEE NOTE 3	GO-75 (0-186)		
	Sealed & Lubricated Track	As Req					
GAA (MIL-L-10924)	Grease, Automotive and Artillery Track Roller Frame Outer & Inner Bearings	As Req	GAA (G-403) AILL TEMPERATURES				
	Bulldozer cyclinder support & Upper Trunnion Bearings	As Req					
	Ripper Linkage & Cylinder Bearings	As Req					
	Fan and Adjusting Pulley Bearings	As Req					
	Bulldozer Tilt Brace, tilt Brace Ball & Socket	As Req					

KEY NOTES:

1. Grade 15W-40 (OE/HDO-15/40) is the perferred lubricant but should only be used when temperatures are above +5 F (-15 C).

2. If OEA lubricant is required to meet low expected temperature range, OEA lubricant is to be used in lieu of OE/HDO-10 lubricant for all expected temperature ranges where OE/HDO-10 is specified in the KEY.

3. Grade 85W-140 (GO-85/140) may be used when expected temperatures are above +10 F (-12 C). The NATO Code for GO-85/140 is 0-228

NOTES

1. ENGINE CRANKCASE. Check oil level daily. Level must be in SAFE STARTING RANGE on ENGINE STOPPED side of dipstick. When engine is warm and running, level must be between ADD and FULL marks on ENGINE RUNNING side of dipstick. Change oil every 250 hours. Run engine long enough to warm oil. Park on level ground. Stop on level ground. Stop engine. Open drain valve and drain oil. Remove oil filter. Clean filter base. Make sure all of old gasket is removed. Apply thin film of clean oil to gasket of new filter. Install filter and tighten until gasket contacts base. Tighten filter an additional ¾ turn. Do not over tighten. Close drain value. Remove breather. Wash breather in clean solvent. Install new seal if necessary. Install breather. Tighten bolt. Fill crankcase. Start engine and run at low idle to fill filter housing. Check oil level.

2. TORQUE DIVIDER SUCTION SCREEN. Wash suction screen whenever oil compartment is drained for repairs on brakes, transmission or torque divider. Remove and separate cover, housing, spring and screen. Wash screen in clean solvent. Install new cover gasket if necessary. Install screen, spring and housing to cover. Be sure pin in housing is aligned with hole in cover. Install suction screen assembly.

3. TRANSMISSION, BEVEL GEAR AND STEERING CLUTH COMPARTMENTS. Oil should be warm before draining. Remove bevel gear, steering clutch and converter drain plugs. Change filter elements (Note 9). Wash magnetic strainer (Note 8). Install all drain plugs. Replace breather. Fill compartment. Start engine. Check oil level. Oil should be up to FULL mark on dipstick.

4. WINCH. Remove fill and drain plugs. Drain oil. Change filter and wash magnetic strainer (Note 5). Clean and install drain plug. Fill compartment until oil is visible in sight gauge. Clean and install fill plug. Check oil level with engine running at low idle. Oil must be visible in sight gauge.

5. WINCH FILTER AND MAGNETIC STRAINER. Remove cover and filter element. Install new element. Install new seal if necessary. Install cover. Remove cover and strainer. Wash strainer in clean solvent. Install strainer. Install new seal if necessary Install cover.

6. FINAL DRIVES. Remove fill and drain plugs on each side. Drain oil. Install drain plugs and fill compartment. Install fill plugs.

7. HYDRAULIC SYSTEM. Check oil level every 100 hours. Check oil level with equipment lowered, engine running at low idle, transmission in neutral and break lock engaged. Oil should be visible in sight gauge. Change filter element every 500 hours. Remove filter assembly from tank. Remove screen and element from cover. Wash screen in clean solvent. Install new seal in cover if necessary. Install screen and new element to cover. Install filter assembly. Operate engine at low idle. Check oil level in sight gauge. Add oil as necessary. Drain hydraulic tank every 2000 hours. Remove plate under fender and drain plug. Insert a one inch (25.4 mm) pipe nipple, approximately six inches (152 mm) long in drain to relieve check valve. Drain oil. Install drain plug and plate. Change filter element. Remove filler strainer and wash in clean solvent. Install strainer. Add oil to tank until it is visible in sight gauge. Check oil level. Install filler cap.

8. TRANSMISSION SYSTEM MAGNETIC STRAINER. Remove cover, spring, screen and magnets from magnetic strainer. Clean magnets with a stiff brush. Do not drop magnets. Clean cover. Install new seal if necessary. Install magnets, screen, spring and cover.

9. TRANSMISSION SYSTEM FILTER ELEMENTS. Remove filter plug. Drain oil. Remove cover and elements. Clean cover. Install new seal if necessary. Secure new element to cover. Install element, cover and drain plug. Run engine at low idle to fill filter. Add oil to bring level to FULL mark on dipstick.

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory.

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

MILTON H. HAMILTON
Administrative Assistant to the Secretary of the Army
03240

Distribution:

To be distributed in accordance with DA Form 12-25-E, Block 5974, requirements for LO 5-2410-237-12.

STARTING, OPERATING, and SHUT-DOWN PROCEDURES

1. Engine starting procedures

   a. Perform a 360 degree walk around.

   b. Mount dozer left side using three points of contact.

   c. Ensure you are wearing double hearing protection.

   d. Buckle and adjust the seatbelt.

   e. Turn main battery switch on

   f. Pull governor control completely back, then push forward until you feel resistance.

   g. Insert starter ignition switch key, turn to start.

   h. Observe all the gauges.

   I. Allow 3 to 5 minute warm up at low RPM

NOTE: Do not crank the engine longer than 30 seconds, or damage to the starter motor may occur.
If the engine fails to start after 30 seconds, allow the starter to cool for 2 minutes before
attempting to start the engine again.

NOTE: If oil pressure does not register within 15 seconds after the engine starts, stop the engine or
serious damage may occur. Stop engine by pushing the control lever forward past the detent.

2. Operating Procedures

   a. Moving the tractor

      1. Raise lowered attachments high enough to clear obstructions.

      2. Release transmission safety lock by lifting lever up.

      3. Depress both brake pedals and release brake lock.

      4. Move transmission selector lever to desired direction gear position.

      5. Pull governor control lever toward you until desired speed is obtained.

b. Changing gears and directions

1. Decrease engine speed by depressing decelerator.

2. Move transmission selector to desired gear.

3. Return to desired engine speed

CAUTION: Keep tractor under control at all times. DO NOT NEUTRALIZE TRANSMISSION to allow tractor to coast. Select gear range before starting on downgrade. DO NOT SHIFT TRANSMISSION WHILE ENGINE IS AT HIGH RPM.

c. Steering procedures

1. To make a gradual right turn, pull the right steering clutch lever to the 1st position. Release lever to end turn.

2. To make a sharp right turn, pull the right steering clutch lever all the way out. Release lever to end turn.

3. To make gradual left turn, pull the left steering clutch lever to the 1st position. Release lever to end turn.

4. To make a sharp left turn, pull the left steering clutch lever all the way out. Release lever to end turn.

CAUTION: When steering on a steep downgrade the tractor will respond differently to the steering controls.

d. Stopping procedures

1. Reduce engine speed by pushing governor control lever.

2. Move transmission selector lever to NEUTRAL.

3. Push transmission safety lock down to the lock position.

4. Depress left brake, engage brake lock, and depress right brake firmly.

5. Lower all equipment.

STARTING, OPERATING, and SHUT-DOWN PROCEDURES

3. Shut-down procedures

a. After engine has operated at low idle for 3 to 5 minutes, Push governor control lever past detent to stop engine.

b. Turn start switch to off.

c. Turn disconnect switch off.

CAUTION: Never turn disconnect switch OFF when the engine is running. Serious damage to the electrical system will result.

4. Cold weather starting procedures

a. Try starting the engine using the Engine starting procedures on the previous page.

b. If engine does not start, push the starting aid button while cranking the engine, and hold for three seconds (time required to fill the chamber). Ether is injected when aid switch is released. Use additional starting fluid once every two seconds until engine runs smoothly.

c. If oil pressure does not register within first 15 seconds, stop engine immediately and investigate. If oil pressure is normal, proceed to step (d).

d. Run engine at reduced speed only long enough to circulate the oil through the engine, then increase speed and warm up the engine.

e. Cover the radiator if necessary to bring engine temperature up to operating level.

CONSTRUCT A STOCK PILE WITH A CRAWLER TRACTOR

PURPOSE: To provide the student with the guidelines and knowledge necessary to construct a stockpile
with the crawler tractor.

SAFETY: Know and adhere to all hand signals. Maintain three points of contact when mounting or
dismounting equipment. Perform 360 walk around before mounting or dismounting equipment.
Wear double hearing protection, eye protection, hard hats, and seat belts when operating
equipment. Do not wear loose clothing or jewelry. Always look to the rear when backing up.
Raise blade (and ripper if equipped) before backing up. Use caution when working on hills,
banks, or slopes to avoid tipping. Do not place transmission in neutral to allow the crawler
tractor to coast.

REFERENCES: FM 5-434, earth moving operations, 30 September 1999
TM 5-2410-237-10, tractor, full tracked, low speed, ded, medium draw bar pull, D7G,
January 1993.

PROCEDURES:

1. Start the crawler tractor IAW TM 5-2410-237-10.

ENVIRONMENTIAL: Be aware of these environmental considerations:

While moving in off road terrain, avoid unnecessary damage to water ways or vegetation.
Dust and exhaust created by the use of equipment also affects the environment, avoid any
unnecessary equipment usage. Damage is caused by erosion due to rain, this erosion damage
can be minimized by dressing off the work area at the end of each day.

2. Construct a stock pile

NOTE: Stock piles must be a minimum of 5’ in height to be to school standard.

a. Start on a level surface within designated area.

b. Slowly lower the blade to a dept of 4” to 6”. Do not excavate deeper than 4” to 6", while at
the same time maintaining a smooth cut.

f. Position the crawler tractor at the start point, with approximately 1/3 of the blade overlapped onto the first pass. Maintain a direction directly toward the original stockpile. Do not build a burm.

g. Stockpile by pushing the material on successive cuts, in the same manner, working the crawler tractor from the start point, all the way around the work area in either a clockwise or a counter clockwise direction, always ending at the same stockpile.

CAUTION: Keep tractor under control at all times. DO NOT place transmission in neutral and allow the machine to coast downhill. Select gear range necessary before starting down grade. Do not change gears while going downhill.

h. Ensure the area that material is being cut from remains level $\pm$ 4". **DO NOT** back blade to level.

NOTE: Do not stop the forward motion or cause tracks to spin while pushing material.

i. Make successive cuts the same as in step (b), constructing the stockpile higher on each pass until it reaches the desired height.

NOTE: Once you have completed you project, restore the area as close as possible to the original state.

3. Perform shutdown operations IAW TM 5-2410-237-10.

SPREAD A STOCK PILE WITH A CRAWLER TRACTOR

PURPOSE: To provide the student with the guidelines and knowledge necessary to spread a stockpile with the crawler tractor.

SAFETY: Know and adhere to all hand signals. Maintain three points of contact when mounting or dismounting equipment. Perform 360 walk around before mounting or dismounting equipment.

Wear double hearing protection, eye protection, hard hats, and seat belts when operating equipment. Do not wear loose clothing or jewelry. Always look to the rear when backing up.

Raise blade (and ripper if equipped) before backing up. Use caution when working on hills, banks, or slopes to avoid tipping. Do not place transmission in neutral to allow the crawler tractor to coast.

REFERENCES: FM 5-434, earth moving operations, 30 September 1999

TM 5-2410-237-10, tractor, full tracked, low speed, ded, medium draw bar pull, D7G, January 1993.

PROCEDURES:

1. Start the crawler tractor IAW TM 5-2410-237-10.

ENVIRONMENTIAL: Be aware of these environmental considerations:

While moving in off road terrain, avoid unnecessary damage to water ways or vegetation.

Dust and exhaust created by the use of equipment also affects the environment, avoid any unnecessary equipment usage. Damage is caused by erosion due to rain, this erosion damage can be minimized by dressing off the work area at the end of each day.

2. Spread a stock pile

a. Start the crawler tractor moving forward and lower the blade to desired height.

b. Adjust the blade and move the crawler tractor into the side of the pile using 1/3 of the blade to cut.

NOTE: Using the left side of the blade, continue to work to the left. Using the right

e. Place the tractor in reverse after the blade has been emptied.

f. Raise the blade all the way and back the tractor to the stockpile.

g. Reposition for another cut, again cutting into the stockpile using 1/3 of the blade.

CAUTION: The operator must be satisfied that no one will be endangered before and while backing the machine.

h. Repeat steps until the stockpile is evenly spread over the designated area. Do not back blade to “level’.

i. Restore the area as close as possible to its original state, once you have completed the project.

3. Perform shutdown operations IAW TM 5-2410-237-10.

CONSTRUCT A DITCH WITH A CRAWLER TRACTOR

PURPOSE: To provide the student with the guidelines and knowledge necessary to construct a ditch with the crawler tractor.

SAFETY: Know and adhere to all hand signals. Maintain three points of contact when mounting or dismounting equipment. Perform 360 walk around before mounting or dismounting equipment.

Wear double hearing protection, eye protection, hard hats, and seat belts when operating equipment. Do not wear loose clothing or jewelry. Always look to the rear when backing up.

Raise blade (and ripper if equipped) before backing up. Use caution when working on hills, banks, or slopes to avoid tipping. Do not place transmission in neutral to allow the crawler tractor to coast.

REFERENCES: FM 5-434, earth moving operations, 30 September 1999

TM 5-2410-237-10, tractor, full tracked, low speed, ded, medium draw bar pull, D7G, January 1993.

PROCEDURES:

1. Start the crawler tractor IAW TM 5-2410-237-10.

ENVIRONMENTIAL: Be aware of these environmental considerations:

While moving in off road terrain, avoid unnecessary damage to water ways or vegetation.

Dust and exhaust created by the use of equipment also affects the environment, avoid any unnecessary equipment usage. Damage is caused by erosion due to rain, this erosion damage can be minimized by dressing off the work area at the end of each day.

2. Construct a ditch

a. Start with the crawler tractor in as level a position as possible.

b. Adjust blade for ditching and ensure the blade is level.

c. Start on level ground.

d. Position blade approximately 1/2 foot off the ground.

i. Raise the blade all the way, and back the crawler tractor back to the starting point, keeping the crawler tractor in the same path.

j. After initial marking cut, strive to cut as much material as possible while maintaining control of machine.

k. Maintain 4:1 entrance and exit ramps.

l. Continue same process, each pass dumping dirt off back side of exit ramp.

3. Correcting Errors

NOTE: The slower the engine rpms, the more sluggish your blade control. If you attempt to cut too deep, a hump will be formed in the bottom of the ditch.

a. Cut off top of hump. Do not attempt to straighten with full pass.

b. If bottom of ditch is not level:

(1) Back out of cut onto level ground.

(2) Make pass, cutting just enough to straighten out ditch bottom.

(3) Start on level ground to make a level cut.

c. Do not over control.

4. Backfill and Level

NOTE: No one goes over ramp the first time without instructor supervision.

a. Go approximately ½ way up ramp.

b. Lower blade smoothly but quickly to obtain full load.

c. Proceed over top with full load.

d. Raise blade gradually to build ramp on backside of stockpile.

e. Repeat procedures until you can drive down backside of stockpile.

f. Reverse tractor direction.

g. A line crawler tractor in same path facing opposite direction and begin

h. Again go approximately ½ way up the ramp.

i. Lower the blade smoothly to obtain a full load.

j. Spread the dirt evenly back into the ditch.

k. Reverse the crawler tractor and back over the ramp.

l. On each pass, lower the blade smoothly to obtain a full load of dirt from the hump, and backfill the ditch.

m. Continue cutting center of stockpile until level with existing grade. Remember to keep work area level.

n. Maintain level of fill to existing grade.

o. Starting at back of windrows, position the crawler tractor at a 45° angle. Moving forward, take half-blade width and push into fill.

p. Alternate windrows.

q. Maintain windrows as you backfill by slot dozing.

r. Keep work area level at all times.

s. Restore area as close as possible to its original state.

5. Perform shutdown operations IAW TM 5-2410-237-10.

Notes